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Double Axle Lathe.

We present on this and the succeeding page a perspective and some detail engravings of the latest form of double axle lathe as built by the Putnam Machine Company, Fitchburg, Mass.

A glance at the engraving will show that the lathe is of neat yet massive design, the bed approaching the box form as nearly as seems practicable with a lathe bed, being closed at the bottom for the double purpose of giving strength and rigidity, and affording a tank in which the soda water or other lubricant used on the tools is received, strained from the chips, and by a small pump with relief valve, supplied to the tools in a stream during the turning.

The driving is effected through the medium of a worm gear which is supported by a bearing at each side. On the same shaft as the cone pulley (shown in Fig. 2, page 2) is a steel worm 7" diameter, which drives the large worm wheel having 36 teeth of 2" circular pitch, the end thrust of the worm being taken on 20 steel balls ⅝" diameter, by which means the friction is very much reduced.

There is an equalizing or self-centering dog ring, by which the axle is driven steadily and without tendency to deflect it, while it revolves upon dead centers and is finished in one position, thus insuring accuracy.

Each carriage can be handled independently of the other, there being two independent lead screws each driven from the same shaft, which is placed below them and driven through the medium of the worm and spur gearing shown in Figs. 2 and 3, connection being made between this shaft and the lead screws by means of two sets of gears arranged as shown in Fig. 3, where the two larger gears are keyed to the lead screw, while the pinions are running fits on the shaft and are driven by means of the sliding key which is worked by the vertical lever placed at the side of each carriage. This enables the feed to be varied to suit roughing or finishing cuts without loss of time.

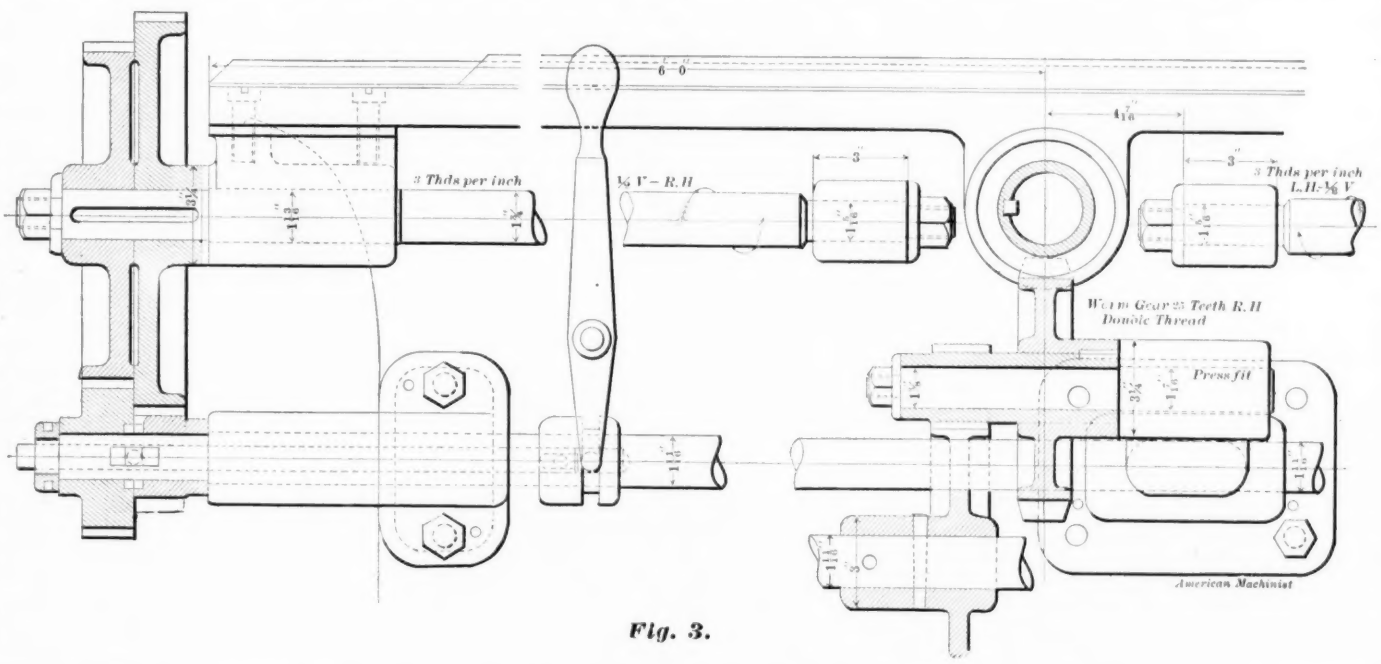
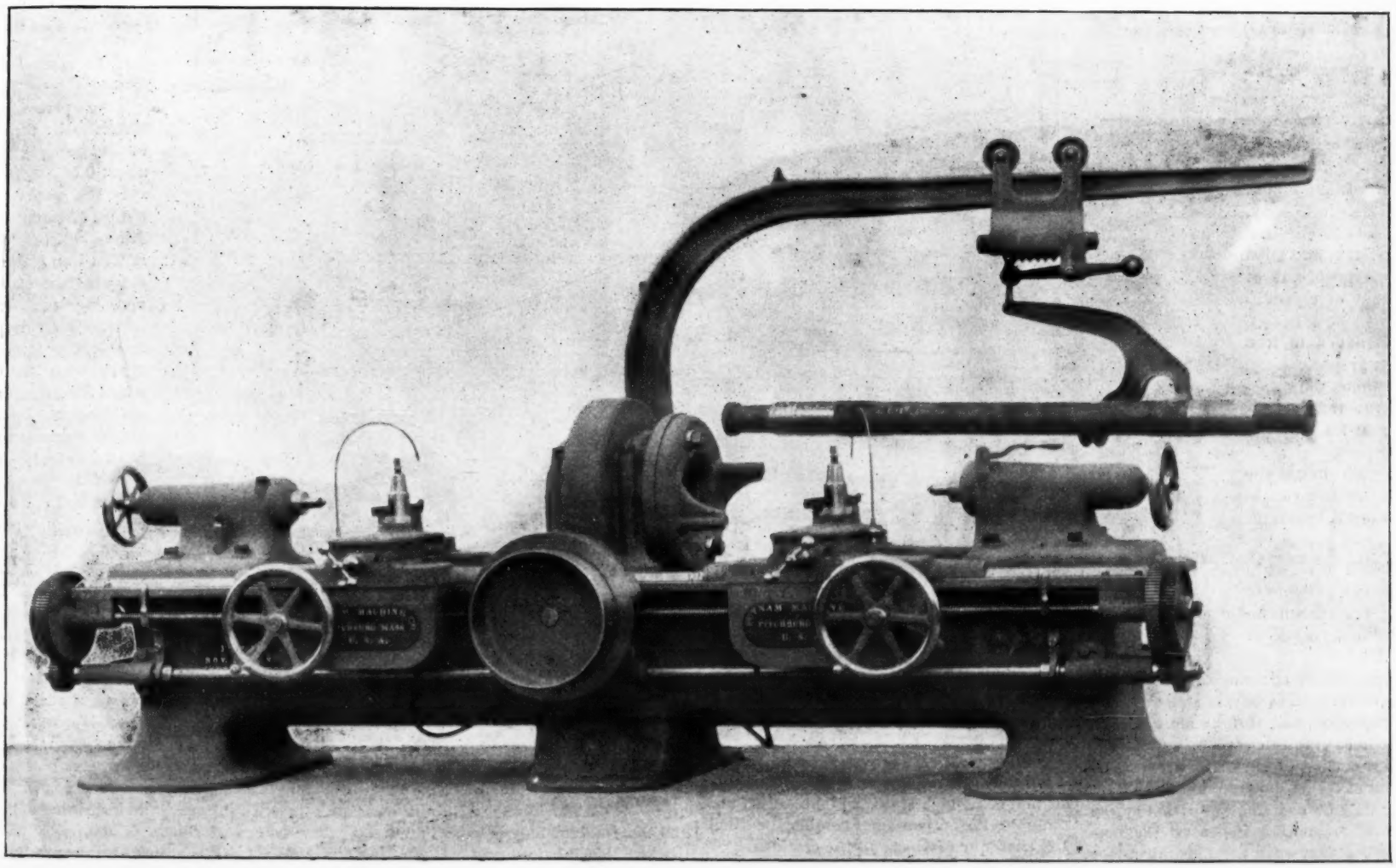


Fig. 3.

Fig. 4 gives a side view of one of the carriages, showing that it rests upon one V at the back, and in front upon both Vs, the inner one being nearly under the tool and tending to greatly strengthen and support the carriage during the cutting and to reduce wear. No racks are used, the carriages being moved by the steel screws, whether feeding by power or by hand.

The bevel gears and portion of vertical shaft seen in Fig. 2 are for driving the



DOUBLE AXLE LATHE.

pump which is located in the tank below, and there is a complete system of conduits and piping by which the flow of water is kept within bounds, and there is no "slopping."

The foot-stocks are secured to the bed by four bolts, are made extra heavy, and with long bearings on the bed.

There is a strong and convenient crane attached at the back of the lathe, having an improved double crank hoist and solid axle hook by which axles are very easily handled.

The lathe swings 25¾" over the bed, 13" over the carriages, and will take in 7½ feet between centers. The countershaft is driven by two sets of tight and loose pulleys 16" diameter, 6" face, and should make 540 and 640 revolutions per minute. The lathe weighs, complete, 10,500 pounds.

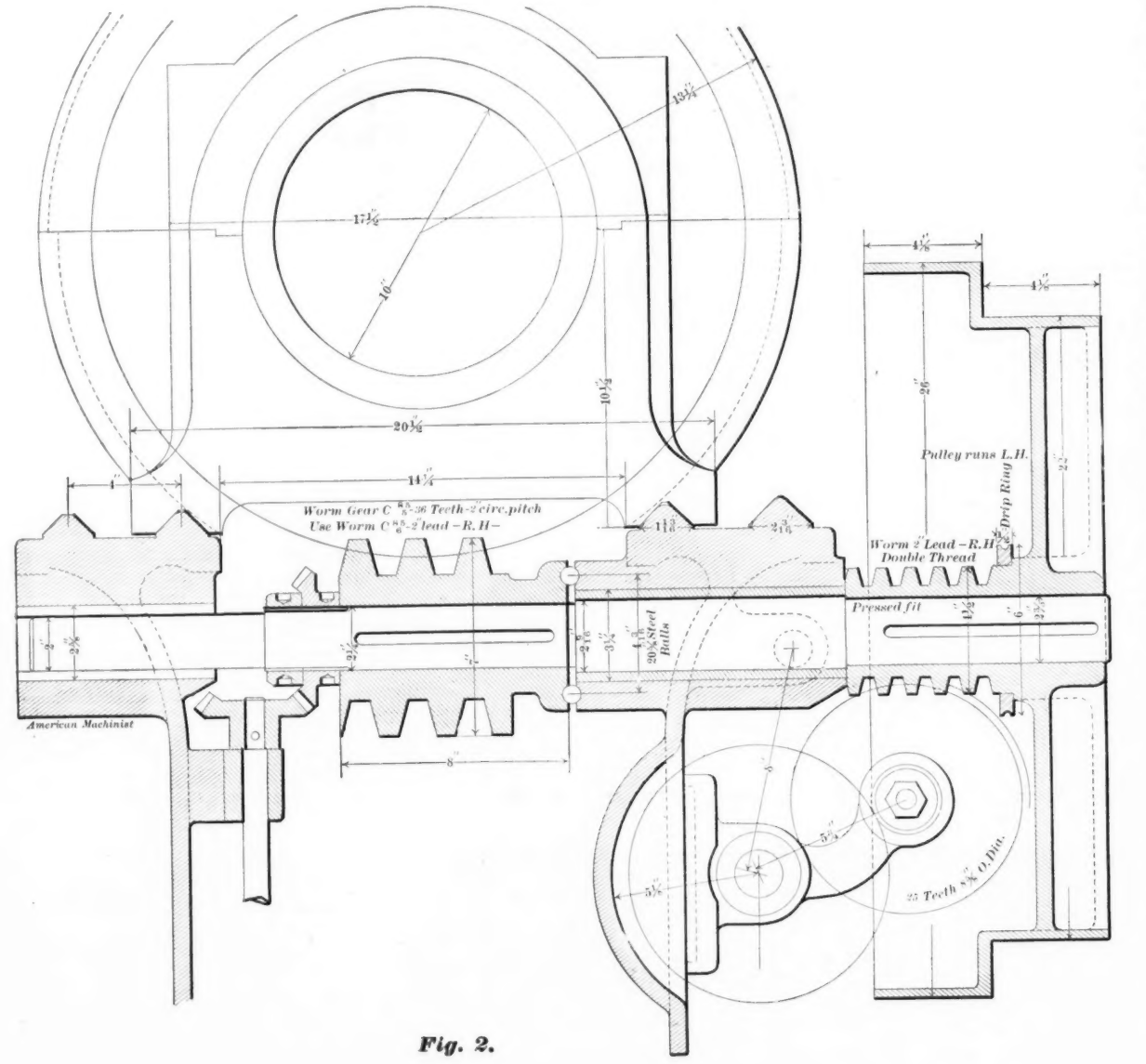


Fig. 2.

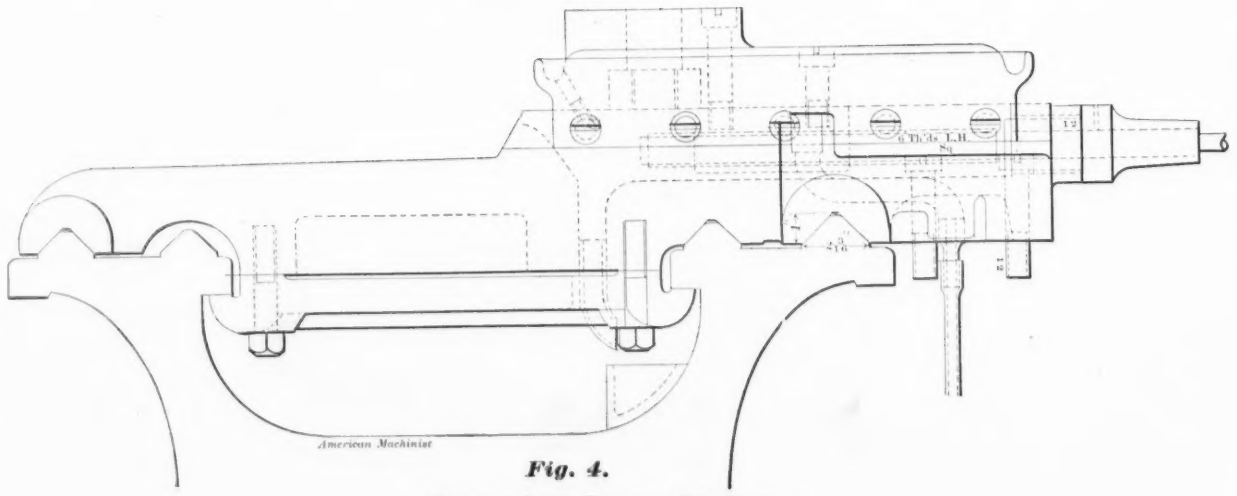


Fig. 4.

DOUBLE AXLE LATHE.—SEE PAGE 1.

Cast-iron Mixtures.

BY S. BOLLAND.

II.

With the view of becoming better acquainted with the nature of "pig iron," let us determine what influence carbon, manganese, sulphur, phosphorus and silicon have upon it.

It must be understood that the strength of cast-iron depends on: (1) The amount of weakening impurities present. (2) The proportion existing between the *combined* and the *graphitic* carbon.

According to their influence on the properties of cast-iron, the elements mentioned may be classified into two groups: (1) Softeners — graphitic carbon and silicon. (2) Hardeners — combined carbon, manganese, sulphur and phosphorus.

GRAPHITIC CARBON.

Carbon existing as graphite in cast-iron makes it soft and tough, and increases its fluidity.

When molten iron solidifies, the liberation of the carbon occurs at the instant of crystallization.

Silicon added to iron produces graphite.

The amount of graphite in gray irons varies from about 1.5 to 3.5 per cent.

In Scotch irons, the graphitic carbon should not be below 3.0 per cent.

COMBINED CARBON.

Combined carbon in proper proportion to graphitic carbon increases the strength of cast-iron.

Cast-iron which contains too much combined carbon becomes harder and more brittle in proportion, and shrinks more in cooling than does graphitic carbon.

Sudden cooling of the metal prevents the liberation of carbon as graphite, and retains it in the state of combination with the iron.

Repeated remelting increases the combined carbon, and when *silicon* is taken from iron, the combined carbon is also increased.

For soft castings the mixture should not contain over 0.2 per cent. of combined carbon, but for strong castings 0.4 to 0.8 per cent. is admissible, and in some cases even more.

So called "Scotch" irons or "softeners" should contain a maximum of graphitic, and a minimum of combined carbon. The best brands of these irons sometimes contain less than 0.1 per cent. of combined carbon.

MANGANESE.

Manganese tends to the formation of combined carbon, reduces the tensile strength, makes the iron hard and brittle, causes more waste by reason of the formation of additional slag, and acts in a contrary direction to *silicon*.

Manganese in foundry irons varies from mere traces to over 2.0 per cent.

For the reasons as herein stated, manganese can only be tolerated in very strong castings, and even then should not exceed in the mixture over 0.5 per cent.

SULPHUR.

Sulphur contributes to retain the carbon in the combined state, and probably also promotes the formation of combined carbon, and consequently hardens the castings.

In foundry irons, this element should not exceed 0.1 per cent.

PHOSPHORUS.

Phosphorus causes hardness and brittleness by lowering the separation of graphite, but increases fluidity.

Phosphorus in foundry irons varies from 0.2 to 1.0 per cent., and sometimes even more, but for best results in foundry mixtures, it should not exceed 0.5 per cent, or preferably, 0.3 per cent.

The injurious effects of phosphorus become more apparent in proportion as the percentage of combined carbon increases.

High phosphorus is desirable only in cases where great fluidity, regardless of strength, is the chief desideratum.

SILICON.

Silicon increases fluidity, and reduces hardness and shrinkage of castings by its influence on the combined carbon, changing it into graphitic; but after the bulk of the carbon has become graphitic, through an addition of silicon, any further addition of silicon hardens the casting.

In the foundry, the problem is to have the right proportions of combined and graphitic carbon in the resultant castings, and the fundamental laws in foundry practice are, that in white pig iron an addition of *silicon* precipitates the combined carbon in the form of graphitic carbon, and causes gray iron to be produced, and that in gray pig iron the expulsion of *silicon* converts the graphitic carbon into combined carbon and produces white iron.

The variations, within certain limits, in the proportions of silicon, afford a reliable means of producing castings of any mechanical character which is possible with the materials employed; but the percentage of *silicon* required depends greatly upon the condition in which the carbon exists in the iron to begin with, viz., in an iron when the bulk of the carbon is already graphitic, more silicon may weaken the casting and make it brittle.

Thus, by a judicious use of *silicon*, the proportioning of the carbon may be accomplished according to the wish of the founder.

The amount of silicon producing the maximum of strength is about 1.8 to 2.0 per cent. when a white base is used.

The strongest castings are obtained from irons which, when melted alone, will produce sound castings with the least amount of graphite, and each addition of *silicon* to such iron will decrease strength.

When strength is desired, it should also be borne in mind that the phosphorus, sulphur and manganese must be kept low, or within certain limits.

Gray foundry irons contain from 1.0 to 5.0 per cent., ferro silicons from 5.0 to 14.0 per cent., and castings will vary from 1.5 to 3.0 per cent. of silicon.

In figuring for the silicon contained in scrap iron, the following will be found a safe estimate: 1.5 per cent. for scrap from castings which show a gray fracture; 1.0 per cent. for such as show a mottled fracture; 0.5 per cent. for turnings (cast) when clean; 0.0 per cent. when rusty, and the same for burnt iron.

The percentage of silicon to be figured for in white pig iron is about 0.5.

In the paper written by W. J. Keep, Detroit, Mich., entitled "Silicon in Cast-iron," the whole subject is treated in a masterly manner, and all who carefully peruse its pages must inevitably agree with that illustrious investigator in the conclusions he draws with regard to that wonderful element which he so ably discusses. In the last clause of his paper he says, "We have seen, however, that a white iron which will invariably give porous and brittle castings can be made solid and strong by the addition of silicon; that a further addition of silicon will turn the iron gray, and that as the grayness increases the iron will grow weaker; that excessive silicon will again lighten the grain, and cause a hard and brittle, as well as a very weak iron; that the only softening and shrinkage lessening influence of silicon is exerted during the time when graphite is being produced, and that silicon of itself is not a softener, or a lessener of shrinkage, but through its influence on carbon, and only during a certain stage, it does produce these effects."

From the foregoing it must be inferred that if founders are to keep pace with this age of discovery, they must be willing to

leave the old beaten tracks of indecision and doubt, and seize upon the more tangible methods which science reveals to us every day.

The suggestions herein contained should, I think, go far towards making what has hitherto seemed a mystery, appear as a problem easy of solution; for instance, a casting is required that shall meet certain conditions; a careful study of the foregoing will enable the founder to know what proportion of the several elements may, with safety, be allowed to enter into the mixture, and knowing, from previous *analysis* what the stock consists of, he can at once decide which course to pursue, and all this with a positiveness which is simplicity itself.

The reader will also see how effectually this method will eradicate the old foundry nomenclature, as instead of the present distinguishing terms as applied to cast-iron in stock, we should know them, according to analysis, as brands high, medium or low, in one or more of their constituent elements.

Of course a thorough knowledge of this proposed innovation will mark a new era in the prices of cast iron, as before stated, because the demands for so-called No. 1 irons will not necessarily be as urgent as is now the case; and I am surprised that employers have not before now grasped the situation, for it is no exaggeration to say that if the services of the metallurgical chemist were more generally insisted upon, and the proposed method adopted in its entirety, an immense saving would be effected, as lower grades of iron could be used with absolute certainty.

It must not be supposed that the founder can, under any circumstances, omit the care and supervision always requisite where the best practice is to be obtained.

While scrap, so-called, ceases under the proposed change to be a drug, and becomes, in some instances, a prime necessity, every precaution must be taken to insure its successful reduction in the cupola; all such as is very dirty should be thoroughly cleaned, and when there is a large quantity of very fine scrap it is preferable to charge it all together, at the last of the heat, mixed with as much high silicon iron as will insure its conversion into a desirable mixture.

When it is remembered that scrap, especially such as has been frequently remelted, contains a larger amount of combined carbon than the original pig from which it was made, there will be no difficulty in understanding that such scrap, judiciously used, will neutralize any tendency to sponginess which may be inherent in the pig, such mixtures to be proportioned according to the degree of fineness desired in the resultant casting.

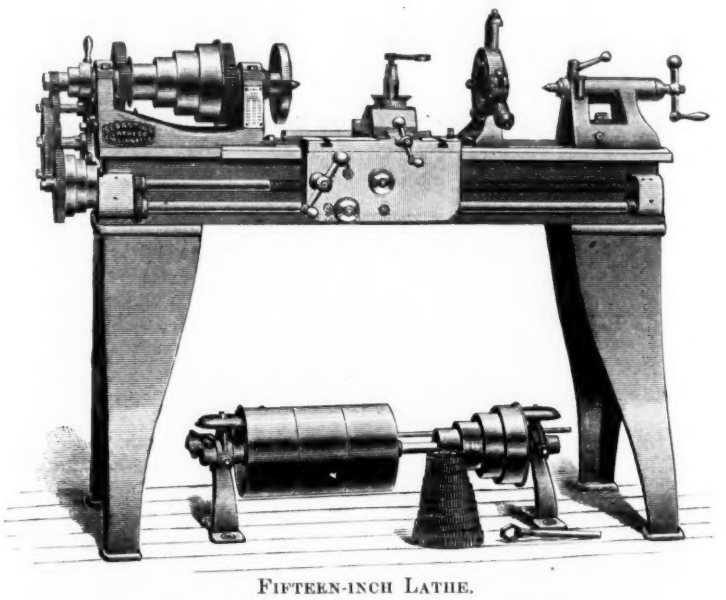
Too little care is exercised in the choice of a man to attend the cupola, and if employers could be made to see how much they lose every year through sheer incompetency in the management of that important department, we should soon see a different class of men employed. An ignorant man cannot be expected to take any interest in mixtures, economy, and the numberless other important factors which are indispensable where the best results are looked for.

A carefully kept record of every day's melting is absolutely necessary, for no matter however precise the mixtures may be made, there will always be neutralizing influences, more or less, at work to make such a course indispensable, the several adverse results can be noted, and the reasons for such inquired into.

Physical tests must also be taken; for it must be borne in mind that in this business nothing is absolute, so many things, unavoidable sometimes (conflicting, nevertheless), such as different degrees of heat, rapid melting or the opposite, and countless other contingencies exist; and these make it imperative that test bars be made each melt, with the view of ascertaining the exact amount of shrinkage, tendency to sink or draw, tendency to chill, degree of hardness, strength, etc., all of which make useful data for future reference.

Fifteen-inch Lathe.

We illustrate herewith an improved 15″ engine lathe built by the Sebastian Lathe Co., Cincinnati, Ohio. The general design of the lathe is sufficiently plain from the engraving, which shows that it is a gibbed lathe with independent rod feed, so arranged that either the screw or the rod can be driven either by gears or the belt, thus giving a wide range of feeds. The screw and rod are connected by the sliding gears shown.



FIFTEEN-INCH LATHE.

The lathe is double compound geared, *i. e.*, there are two intermediate studs for change-gears, thus giving a wide range of threads which can be cut. The cone is for a 2″ belt, the largest step being 8″ diameter. The spindle is of steel, and has a $1\frac{1}{16}$″ hole through it, the front bearing being $2\frac{3}{16}$″ diameter, $3\frac{1}{2}$″ long. An improved device is employed for reversing the screw to cut right or left-hand threads w thout change of gearing.

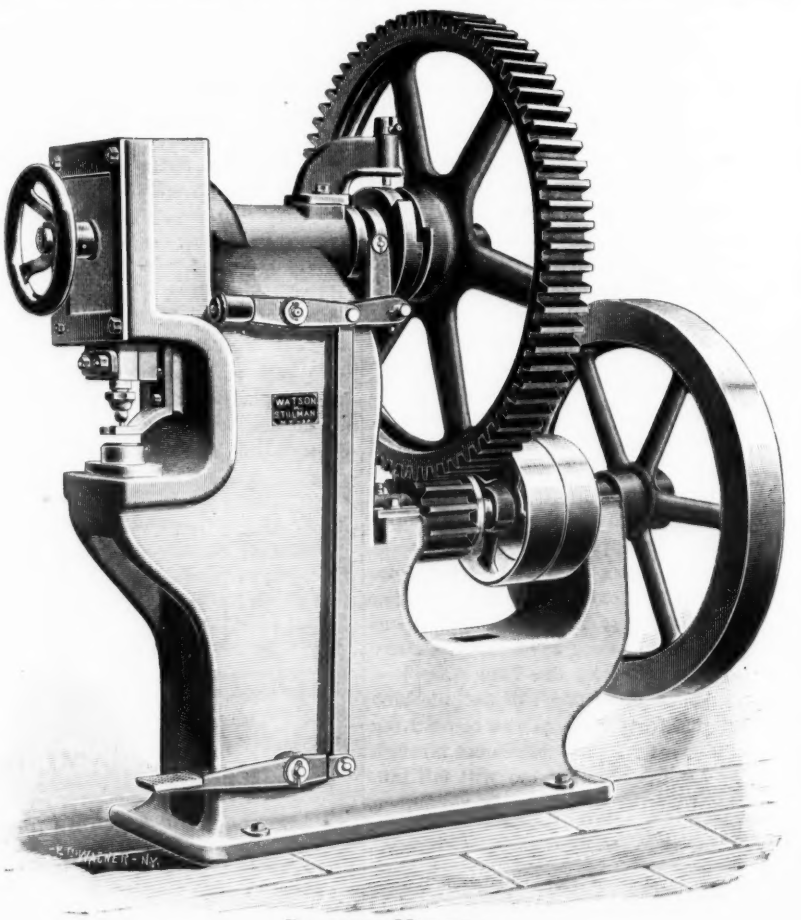
The lathe is built as shown, or with a gap bed as may be desired, and swings 22″x6″ in the gap, $10\frac{1}{2}$″ over the carriage. It is also furnished with foot motion, compound rest or automatic cross-feed, when desired. Its weight as shown, with a 6-foot bed, taking 36″ between centers, is 1,075 pounds.

The men who attend to naval matters for the United States have come to the conclusion that the "New Navy" is deficient in so far that the vessels are not provided with torpedo nets. Hence, there is to be a competitive test between the Bullivant net so largely used in Europe, and a net invented by Midgley, an American. While a good deal of ingenuity is finding vent in devising torpedo nets to protect vessels from attacks by torpedoes, the torpedo makers are equally busy in planing ways to render such nets of no avail, so that there bids fair to be a lively business in these two branches of industry.

Punching Machine.

Messrs. Watson & Stillman, of New York City, say that so many of their customers—users of their No. 6 hand punch—have prospered and put in power, that they have found it necessary to add to their line the machine which we illustrate by the accompanying engraving.

A new style of crosshead block is employed in which a slightly faster upward than downward motion is obtained, and the sliding friction is reduced to a minimum. According to whether the pin in the ram overhanging the clutch is down (as shown) or raised, the punch stops automatically at top of stroke, or is continuous in its motion. The clutch can be thrown into action by the foot when working on small work, or by hand lever above the work when it is wide. A hand wheel on the end of shaft serves to bring the punch down on the work if desired, or to adjust the die. The shaft has a good bearing in the face-plate, and this is made so that the strain is not carried on the bolts. The punch socket is held by a clamp which can be loosened, and the punch removed without disturbing the die, and shear attachments can be fitted for cutting bar or angle iron. If it is desired to use the punch on angle iron, it will be fitted for the work without extra charge; but this is not done unless called for, as it reduces the die support if heavy punching is desired to be done upon the tool. The gears are 36 inches and $6\frac{3}{4}$ inches in diameter. The driving pulleys are 15 inches in diameter and should run at about 135 revolutions per minute.



PUNCHING MACHINE.

Suggestions in Drawing Boards.

BY A. D. PENTZ.

The writer is not an artistic draftsman. Perhaps the reason may be that he started wrong, is not careful enough, is not capable, or he may think that the present tendency in engineering progress is too largely one of artistic delineation and too little of practical execution. He, however, will admit that there have been many opportunities in practice, and that if he had availed himself of them as industriously as he should have, or as persistently as he had tried to master the material side of machine work, he might not have so frequently to employ others to do that branch of the art.

In an architect's office, a few days ago, a fine perspective view of a residence was being drawn. This view's vanishing point was about fifteen feet distant from the elevation. Large folding doors from one room in that office to another were open, and a blade of the required length was attached to a pivot in one of the windows. Every other occupant of the rooms was crowded to the side, and on the ragged edge of fear that some one should accidentally disturb the long blade. Hesitating to make a suggestion because it might not be well taken, and besides it might not be new, nothing was said. But why did not that draftsman cut a concave arc from wood of the desired radius, as long as his drawing board, and fasten it to the edge of that board? Then if he should round the ends of the stock of a T square, so that it could not scrape on the arc, the same effect exactly as with the blade would be got in the office space ordinarily used to draw a plan view. I have never seen such an arc used for this purpose, and it may be new. It could be hinged to fall away like the leaf of a table, so as to permit the use of the square on the straight edge of the board when necessary. Of course, it is obvious that a convex arc, if used, would locate the vanishing point on the opposite side of the drawing, but the head of the square would require a modification considerably greater to adapt it to the curve.

Generally employing the services of draftsmen, the writer frequently has had to study the problem of providing drawing boards for their use. Of course his experience with these boards has been, in most cases, that of others, but in one or two particulars he desires to state results. He has found soft pine plank the best material. A board four feet square should be at least two and one-quarter inches thick when new. End cleats are of no use. Under cleats should be used, and be grooved on both their sides, held to the board by clips and screws, and not be dovetailed or grooved into the drawing board. Thus both sides of a board can be used. If a drawing board be well oiled after it is faced, and given two light coats of shellac varnish, its surface will be harder, at the same time admit the tacks as freely as before, and may be washed without expanding the board.

In shops of considerable size the drawing is seldom used in practice, but is traced and then that is blue-printed from. It seems to me that in such a case the paper might be used without cutting the roll, and then stored away as a roll. There is, however, one objection to this plan, and that is, the handling of the roll of paper for reference afterward. But when the quantity of drawings is remembered which a roll of paper could contain, it will be seen that a like

amount cannot be stored as well or as cleanly in so small a space, either in drawers or on shelves. There is to be said in favor of this plan, every designer knows, and all have had the same experience, that at times a machine or other device is laid down on paper, and either for some inherent fault, or because it is not adopted by the management it is never made in material form. Now it is also the experience of every designer that every design or sketch which he makes contains a mechanical idea, or suggests one. It is no matter how small this idea may be, or how insignificant it is at the time considered to be, there will surely come a time when it will be needed, either for use or to prove something by. This is so well appreciated by old designers that it is the practice of many of them to save every sketch they make, as well as all memoranda in their note-books. This is a cumbersome and perhaps a selfish way, but it certainly preserves for the use of at least one man what would otherwise often be lost. A designer, now the superintendent of one of the best known electrical instrument shops in the world, in conversation said to me that he had no use for "Haswell" or other books of such data while he retained his note-books. This may be an extreme case, or an extreme statement, but it is a fact that a man's own ideas or those in his experience are of more use to him than those of others, or those treating a subject in an unfamiliar manner. Hence, if a roll of paper were drawn on as a whole, and every sketch, note, memorandum, formula, calculation, or operation in arithmetic, as well as every finished piece of work were left as made on the whole sheet, then either the draftsman or the designer by a reference to it would understand exactly what was in mind or in hand when the lines were drawn. Ideas are not so cheap and common that we can afford to lose them when once we catch them.

If drawings were thus made and preserved in the original roll of paper, it seems to me a simple matter to have them, if there be a number of these rolls, mounted one over another on a high rack, at the foot of which a drawing or examination board should be placed. Each roll should be on a wooden bar fitting its center, so that when a particular roll was being overlooked, it would turn with its bar on the end supports in the rack, the paper would be unwound and pass downward to the top of the board, under a revolving roller, across the table, and be, by turning a crank, rewound on a bar similar to the one within the rolls on the rack. I believe this would be simpler, quicker as a whole, and prevent the escape or the misplacing of what is sought for, which generally occurs just before a search is made.

Of course the handling of a roll of paper in drawing on it, is not one of the least of the things to be considered, but if it had not been considered in a manner satisfactory to the writer, this article would never have been written.

In the sketches, Fig. 1 shows a section through a drawing board and stand, cutting the rolls and the paper from end to end. Fig. 2 is a central section, parallel to the rolls for the paper. Fig. 3 is an end elevation, showing means to stretch and fasten the paper.

The legs *A* are castings, having circular curved tops to adjust the table upon. These legs are inlet to the aprons *B*, which inlet fits their curved tops. They are connected together by the rods *H* and the bolt *C*. This bolt *C* reaches through the whole length of the stand, passing through the arched slots *T*, round holes in the aprons *B*, the three washers *L*, the sleeve *K*, and the hand nut *M*. It will be seen, when this nut is tightened, that both legs are rigidly clamped to the two aprons, and that the incline of the board *E* is thereby fixed when satisfactorily adjusted.

Through the aprons *B* are fitted the ratchet shafts *F* and *G*. These shafts extend from the outer face of one apron, across the space between, to the outer face of the other apron, and they are slotted to admit the ends of rolls of paper, and have screws to contract these slots and clamp such paper. The ratchet wheels *P* are securely fastened to one end of these shafts, and are engaged by the pawls *S*, which are pivoted to one of the aprons *B*. The slits *I*, through the table *E*, are a length equal to that between the inner faces of the aprons *B*. They are very narrow, and both are rounded on one side to permit the free movement of the paper over the edges of the table within these slits. The drawing paper *D* is at first wound on the shaft *F*,

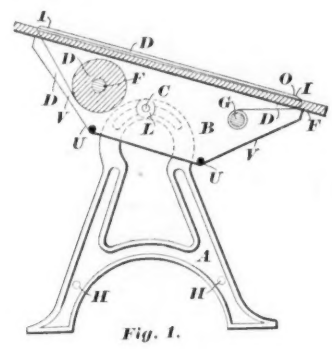


Fig. 1.

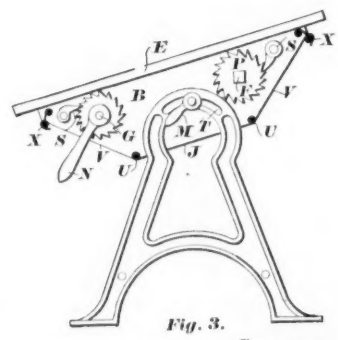


Fig. 3.

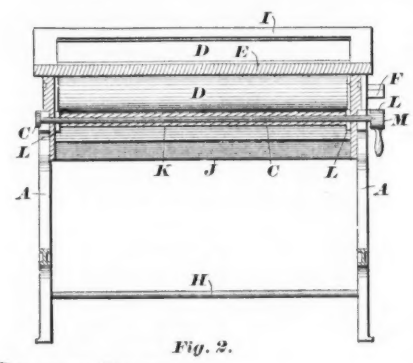


Fig. 2.

SUGGESTIONS IN DRAWING BOARDS.

except just sufficient to reach over the board through the slits *I*, and be attached to the shaft *G*. Both the shafts *F* and *G* are squared as much as they extend beyond the ratchets *P*, and the wrench *N* fits either of them. Hence, with the pawl in the ratchet on the shaft *G*, holding the paper in the position on the board it is desirable that it should occupy; the shaft *F* should now be turned until the paper is sufficiently stretched. Then the pawl that holds the shaft *F* is thrown in. Now, if the paper on the board be slightly dampened, or if it be sized with very thin glue, the paper will stretch, of course, and then if the shaft *G* be turned and secured by its ratchet with the wrench *N*, when the paper is as tight as it can be made the shrinkage in drying will take all the wrinkles out.

Thus the whole roll may be used and transferred from one shaft to the other as it is covered with work. It is obvious that in an establishment where the drawings are preferred to be cut off in the usual manner, that the end of the paper could be tacked at the position *O*, Fig. 1, and the tightening done on the shaft *E*. In this case, the convenience and the advantages over the ordinary method are apparent.

The under edges of the aprons *B* are square, and are used as means to receive the casing *J*, which may be of sheet metal, and the two doors *V* are hinged to it. These doors are fastened by the hooks *X*. It is presumed that this casing will exclude such dirt and dust from the paper as comes from below the board. That which comes through the slits *I* is unavoidable, but will fall into such a position that it cannot be wound on the rolls of paper.

The Proceedings of the Engineers' Club, of Philadelphia, for January, contains several interesting papers, among them being one by Mr. Barton H. Coffey on Rope Transmission. He gives as a formula derived from English tests and practice,

$$H.\ P. = V\left(\frac{D^2 + D - 1}{280}\right),$$

where V = velocity in feet per minute, and D the diameter of the rope in inches. This applies to all cases up to 2,000 feet per minute, but when this speed is much exceeded, the effect of centrifugal force is noticeable, and to this Mr. Coffey's paper is especially devoted. To make the correction for this; the following formula was deduced:

$$H.\ P. = V\left(\frac{2{,}700\ A - W\ V^2}{11{,}180}\right),$$

in which $A = (D^2 + D - 1)$, and W = weight of a foot of rope in pounds. At 2,000 feet, the centrifugal force absorbs about 10 per cent of the transmitting power, and at 7,000 feet there is practically no power left.

Precise Location of Holes.

Shortly after the publication in the AMERICAN MACHINIST of some remarks of mine on the subject of standard gauges and their use in machine construction, I received a letter from Mr. Gilbert Wright, of Newton Highlands, Mass., an extract from this letter being given below as follows:

". . . Having been directly interested in a piece of work illustrated in Fig. 14, in your article on measurements, published January 21st in the AMERICAN MACHINIST, I take the liberty of correcting some statements in regard to this piece of work. I will state in the first place that I invented and designed the typewriter of which these pieces were a part while with the Franklin Typewriter Co., of Boston. Also that the work was done under my supervision. You will notice on the sketch inclosed that the diameters of the pins and holes are slightly different from your published sketch; also that the position of the shorter pin is reversed. These, of course, are immaterial, as you only use it as an illustration of close work. But what I wished to call your attention to was the manner in which Mr. Bowers located the holes in piece marked *A* on my sketch. The piece was first finished to dimensions all over, then accurately centered on a face plate, the center hole bored to size—a plug inserted in this in which a fine center was then countersunk. The other hole was then laid off and marked with a fine prick punch exactly $\frac{1}{2}''$ from the first hole. This measurement was effected by the use of a fine scale and a double eye glass. The piece was then clamped to the face-plate and the second hole bored, after being indicated with a fine indicator. In this class of work Mr. Bowers uses a surface gauge and indicator of his own invention, and I think there is not a workman in the country who can excel him. I have known him to make two jigs by this method, in which were three holes in line in each jig, as per sketch. These were not compared until completed, when they were found to match perfectly in any position. I could give you many more examples of this class of work, but think this will demonstrate the accuracy of work done in this manner by a fine workman."

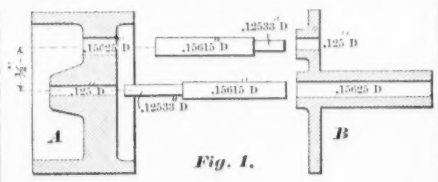


Fig. 1.

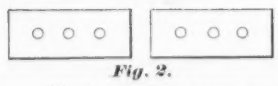


Fig. 2.

PRECISE LOCATION OF HOLES.

Thinking there might be something here of interest to our readers, I addressed a letter to Mr. Geo. W. Bowers, Watertown, Mass., and received in reply a letter from which extracts are given below as follows;

". . . I feel greatly flattered by the compliment which Mr. Wright has paid me in his letter to you in regard to some work which I have done in the past, which has come under his personal observation, for I feel that he is one, with rare ability as a mechanical engineer, to judge a good piece of work when he sees it. You have asked me to give you an account of the tools and process which I employ in laying out and boring holes at precise distances from each other. Now I should be very much pleased to give the readers of your paper the benefit of my experience in this direction, but fear I have nothing new to offer them, but as a detailed account might be interesting to some of them I will venture to give it. Of course there are many ways to get accurate results in this direction, but the one that I give in this letter, in my opinion, is the simplest and most practicable. Now we assume that on the drawing, either for jig or model work, there are two holes to be located just two inches apart. I first take a very accurate scale, graduated so that the lines are hardly perceptible without the aid of a powerful magnifier, then take a pair of dividers or trammel points with very fine needle points, and set them to the scale with the aid of the magnifier. I then have a planed surface which I use for testing work, and strike upon this planed surface on a straight line the measurement that I have previously taken. I then test this measurement with the previously mentioned scale and a powerful magnifier, so that the very fine lines exactly correspond. It may be necessary to renew this test several times before an accurate result is obtained. I further test it, if working for a particularly accurate result, by turning the work in four different directions and testing it under each condition of light. Of course every line, no matter how fine it is, possesses two sides and a center, and by turning the work in certain directions one side of the line is shadowed, and the other side is bright and runs to the center. This is readily discernible with the magnifier, and by turning the work in four directions, if the center shows the same in all it shows that the lines are correct. Having proven that I have got my measurement correct, I now transfer it with the points to the piece of work that I am to lay out. I now take a very fine center punch ground to a 60° angle accurately, and placing it upon the work gradually slide it towards the line. The line having made a very slight indentation in the work, this very sharp center punch, by practice and sense of touch, will be felt to drop into the line. I then slide it very carefully along the line until I come to where the other line crosses. At this point there will be a very slight difference, the intersecting line making a still deeper indentation into the work, and by the sense of touch the center punch, when it reaches this point, will be felt as it drops into this opening. Now having placed the center punch, after holding it about as straight as I can sight with my eye, I take a small hammer and just barely strike it, so that this center is hardly perceptible to the naked eye. I now take the previously mentioned scale and test these two very fine centers under different conditions of light with the magnifier. If they show correctly under these conditions I then swing the work up in the lathe on a perfect face-plate. I now take my indicator, which is made especially sensitive for such work, and also constructed so that it cannot injure the laid-out centers. Of course the needle of this indicator can be very long, and it is merely a question of truing the work up perfectly true in the lathe, and boring the holes by the ordinary process. This letter relates to my method of working from drawings to produce accurate centers as given in the drawings, and although the general process is not new by any means, yet perhaps a few of the details may be."

Though the method of procedure given by Mr. Bowers is, as he says, not new, I think the degree of precision arrived at by that method will be a revelation to most me-

chanics; for it is not, I believe, generally supposed that the method admits of such results as were obtained in this case. His account is certainly very interesting, as would also be a description of his center indicator, which can be used in such a very small center without wearing it out of true before the work is properly located.

FRED J. MILLER.

A New Fourteen-inch Lathe.

We present herewith an engraving giving a general view of a new lathe, and also a detail showing the construction and arrangement of the main bearing.

In general design the lathe does not differ from what has become the standard practice in this country, but is noticeable for neatness and well considered proportioning of parts. The principal divergence from the common practice is found in the main bearing, where, after considerable experimenting, together with close and systematic observation of the behavior of lathe bearings of all kinds, the commonly used metals and constructions were discarded and a shell of babbitt metal used, which is bored out, turned true upon an arbor to fit a taper seat provided in the head-stock, and provided with a threaded ring at each end for adjustment. The shell is cut in three places with a saw, as shown, the upper cut only extending clear through, to allow for closing. At each end of this upper saw cut is placed a piece of leather, which can be compressed by the closing of the box, and, being gripped tightly, forms an oil pocket which extends the full length of the box and allows of perfect lubrication.

Tests have shown that such a box, when given ample area, gives excellent results in regard to wear of the spindle, maintenance of alignment, etc., while, of course, it is a very easy matter to restore alignment perfectly at any time by simply doing a good job of lathe work on a new babbitt shell. The bearing of the spindle is a plain cylinder, without shoulders, end thrust being taken by an annular bearing at the back end of the spindle.

The face-plate is held by a tapered seat and square shoulder, the thread serving merely to hold the plate on, and not to center it or interfere with its truth. Spindle is of steel, with an $1\frac{1}{16}''$ hole through it, the main bearing being $2''$ diameter, $4''$ long. The back bearing is $1\frac{7}{16}''$ diameter and $3\frac{5}{8}''$ long.

The rack and feed gearing are made unusually heavy for a lathe of this size, and, though there is no feed-rod, the threads of the screw are used for cutting threads only, the screw being splined for driving a worm by which the ordinary feed is driven. The screw cuts with the gears furnished from 2 to 32 threads to the inch.

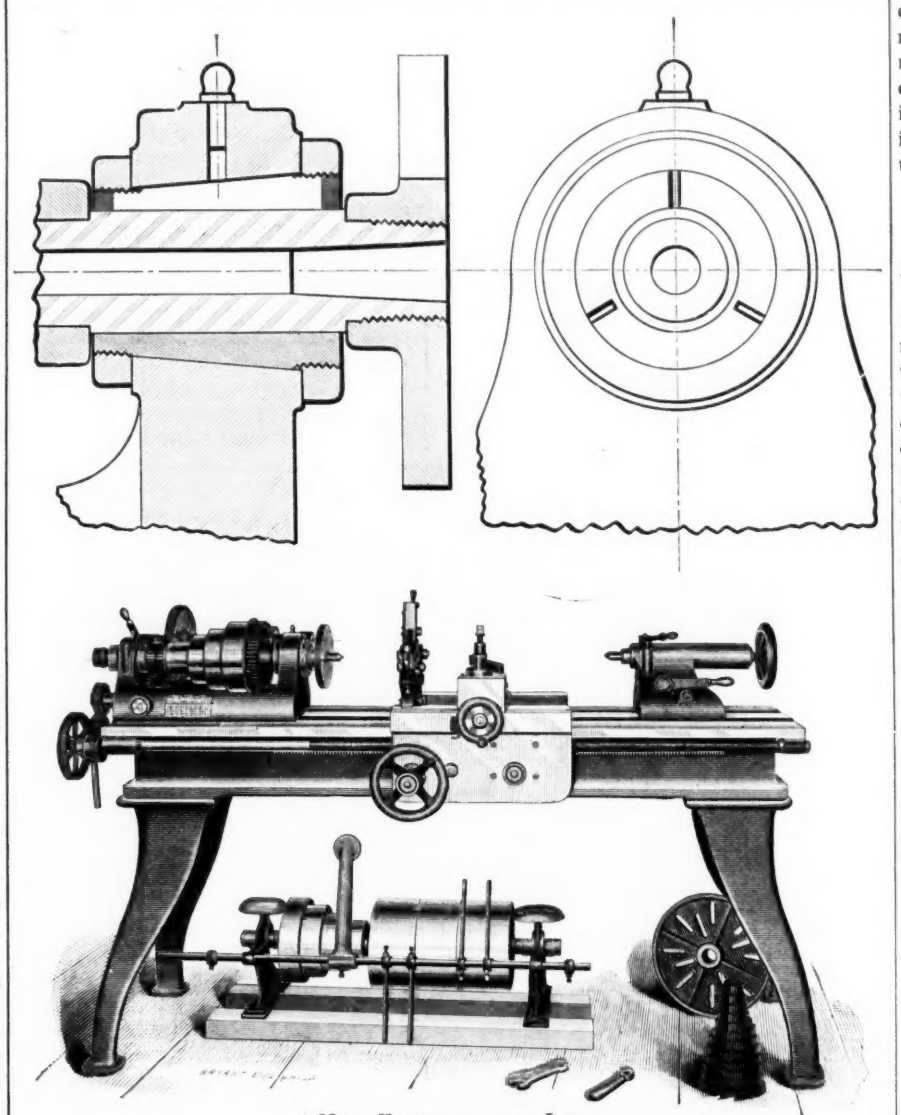
The foot-stock is secured by an eccentric acting upon the holding-down bolt, a simple movement of the lever at the side releasing or fastening it to the shears. The lathe swings over the carriage $9\frac{1}{2}''$; with 6-foot bed takes $38''$ between centers, and weighs 1,200 pounds. It is fitted with either taper attachment or compound rest when desired, and is built by A. Falkenau, Eleventh street and Ridge avenue, Philadelphia, Pa.

Forty-two-inch Knife Grinding Machine.

We present herewith an illustration of an improved knife grinder for grinding knives for wood-planing machines.

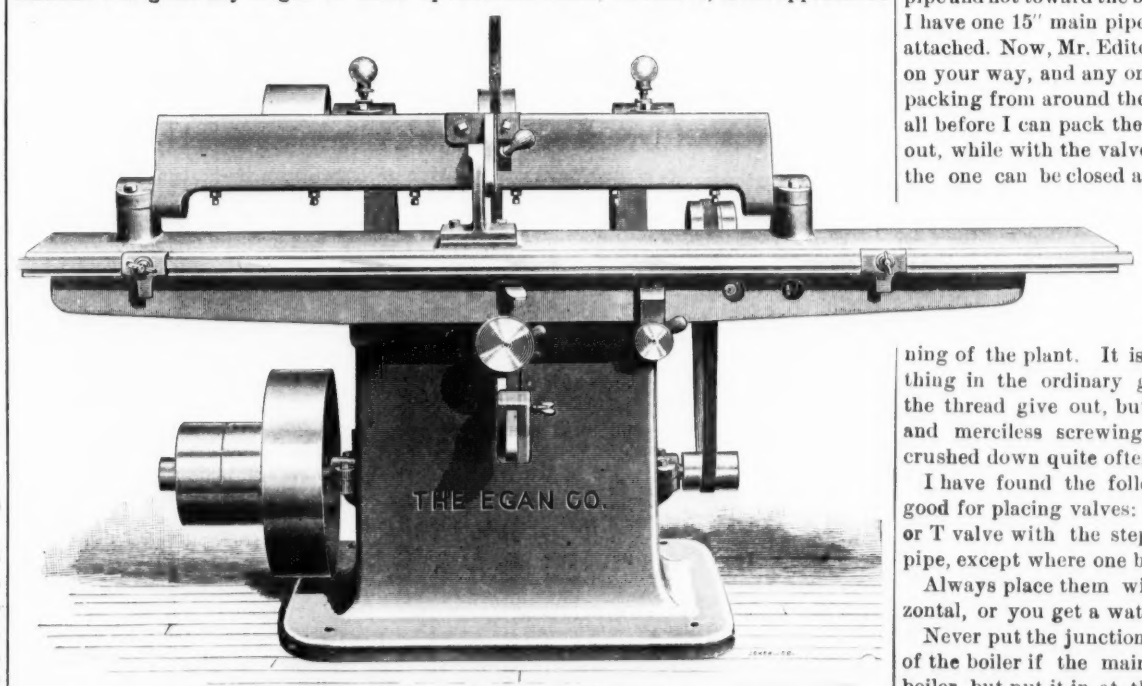
At this day it is, of course, useless to call attention to the advantages of using such machines rather than to depend upon grinding by hand, as these advantages are well understood by all experienced wood workers. It is therefore only necessary to say that the machine presented is automatic in every respect, *i. e.*, a knife when placed in it will be ground by the continuous motion of the carriage from side to side with automatic reverse, being fed up to the wheel the required amount after each movement. When the grinding is completed, it is automatically stopped, and another knife put in its place will be ground exactly the same, thus preserving uniformity and insuring correct balance of the head.

The swinging clamp which holds the knife can be swung back from the wheel, making it convenient to change knives, and also allowing of a very neat device for holding the knife. The frame of the machine is



NEW FOURTEEN-INCH LATHE.

cast in one piece, and the slides for the table are made long enough to support it firmly in the extreme position in either direction. Provision is made for supplying abundance of water to the wheel during the grinding. The wheel grinds a slightly concave surface, which can thus be easily whetted up sharp several times before it is necessary to remove the knives and grind them. The machine will grind any length of knife up to 42 inches, and can be left to take care of itself during the grinding. The machine is built by the Egan Company, 239 to 259 West Front street, Cincinnati, Ohio.



FORTY-TWO INCH KNIFE GRINDING MACHINE.

The Congress Committee on Coast Defenses has made a report in which they favor the establishment of a plant for making heavy guns on the Pacific coast, to be under the joint management of the Navy and the War Departments. It is understood that the War Department was opposed to this arrangement of joint control, and claimed that as coast defenses came under the War Department affairs, that department should have control of the new establishment. We do not know what caused the committee to refuse to take this view of the matter, and should think that under all ordinary circumstances exclusive control by either department would be preferable to joint control. The Navy Department has been making a splendid record at the Washington gun shops the past few years, a record which, we believe, is not approached by the War Department, and possibly if it had not been for this fact the War Department would have found it easier to secure control of the new Pacific coast plant.

London has the largest telegraph office in the world, where more than 3,000 operators are constantly employed.

LETTERS FROM PRACTICAL MEN.

Taper Oscillating Valve.

Editor American Machinist:

Recent experience with a taper oscillating valve, oscillating through about one-quarter of a revolution, leads me to ask the experience of others in this line. The valve has not run long enough to prove the correctness of the criticism that the difference in diameter of the ends will eventually result in such a difference in wear as to make it impossible to keep the valve tight. Can a taper oscillating valve be made a success?

WALTER B. SNOW.

The Mechanics' Pocket-book.

Editor American Machinist:

T. D. DeLand, in your issue of March 10th, has struck the right chord. Who has not felt the want of such a book? Allow me to suggest a good man to prepare such a work—our old friend Chordal. His practical knowledge of the requirements of mechanics in that line, and his ability to compile such knowledge, would insure the success of the work right from the start. There is no discount on his work. Can't you use your influence, Mr. Editor, to bring him out of his shell? While I am personally acquainted with him, and know that he is busy all the time in his professional line, yet I think he owes it to the thousands of young men who owe their advanced positions in mechanics to his early writings to help them and others still further on the road.

R. C. W.

[Chordal has a standing, pressing and frequently repeated invitation to write for our columns, but so far our efforts to induce him to do so have been unavailing.—ED.]

Arranging Valves.

Editor American Machinist:

I was much pleased at Clayton Stanton's letter, for I think there can much be said about the placing of valves, also the kind of valve to be placed.

While we cannot ignore a safeguard, no matter how trivial, we must keep the steam plant in operation sometimes for weeks without a stop.

On two plants that are under my care, with an aggregate of 2,400 horse power, there are over six hundred valves, and after some years of careful study this is what I have found out:

In plants where one boiler only is used put the valve on with the step toward the boiler; but where two or more boilers are used put the valve on with step toward the main pipe and not toward the boiler. For instance, I have one 15″ main pipe with eleven boilers attached. Now, Mr. Editor, if I put the valves on your way, and any one of them blows the packing from around the stem, I must close all before I can pack the one that has blown out, while with the valves on the other way the one can be closed and the safety valve opened until the pressure is down on that boiler, the valve repacked with no interruption to the running of the plant. It is a very uncommon thing in the ordinary globe valve to have the thread give out, but by water hammer and merciless screwing the seat will be crushed down quite often.

I have found the following rules to hold good for placing valves: Place a globe, angle or T valve with the step toward the main pipe, except where one boiler only is used.

Always place them with the stems horizontal, or you get a water pocket.

Never put the junction valve on the nozzle of the boiler if the main pipe is above the boiler, but put it in at the highest point of junction pipe. If put on the nozzle and the pipe runs up horizontally, when the boiler is stopped the pipe fills with water, and if coupled up under pressure it becomes a pipe-breaker and a man-killer.

Never let a junction pipe run into the bottom of the main, but into the side or top.

Always use an angle valve if convenient, as there is more room in them.

Never use a large Chapman valve under high pressure unless you use a run-around.

Never use a globe valve on an indicator pipe.

Always use Chapman, gate, angle or stop-cocks on water, as you get a clear passage.

Buy, if possible, valves with renewable disks, like Jenkins, A. D. & L. R. D.; it saves a big fortune.

Never open a blow-off valve on a boiler a little and then shut it; it is sure to catch the sediment and ruin the valve; throw it well open before closing.

And last, but not least, don't let a man go inside a boiler to work, especially if he is to hammer on it, unless you break the joint between the boiler and valve and put in a plate of steel between the flanges; it does not cost much, and all will be well. PACKING.

Turning Shafting.

Editor American Machinist:

Passaic's questions, in issue of March 10th, remind me of a job of shaft turning, done half a lifetime ago, in which a tool cutting four and one half inches wide was used. These shafts were of two sizes, one about $\frac{5}{16}$" and the other about $\frac{1}{4}$" diameter and about $4\frac{1}{2}$" long on the turned part. The $4\frac{1}{2}$" tool fed towards the center of the shaft instead of the usual way. It will probably be a new idea to some machinists that a $\frac{1}{4}$" steel shaft will stand to have a cut of that width taken. About 100,000 did stand it, and some were cut, as a matter of experiment, to less than $\frac{3}{16}$" diameter. Fig. 1 shows the essential parts of the fixture, *A* being a hard steel block and *B* the tool. The angle of the block was 90°, and the face *a* was tangent to the shaft at a point diametrically opposite the tool when the right size was reached. A modification was planned, but not made, in which any size from zero to the full capacity could be turned. The right angle of the block was revolved about 18°, and located so that the meeting place of the two faces was in the line on which the cutting edge moved. Fig. 2 shows the position. In this the relative position of the tool to the faces was the same, whatever the diameter of the work, or whether straight or taper. These shafts were trip hammer forged, and were anything but round when they went in, but they were round when they came out. The job was done quickly and cheaply, and to the satisfaction of the inspectors.

The two points to be noted are the positions of the faces and cutting tool, and the weight of the fixture. This was at least 1,000 times the weight of the shaft, not including the old trap of a lathe that supplied the "go round."

If, keeping the same ratio of weight of machine to weight of work, we built a lathe to turn a 2" shaft say 20 feet long, we would need to have it weigh about 100 tons. Of this we might make 70 tons of stone and 30 tons of iron. With a bed 30 feet long this would give one ton of iron and 40 or 50 cubic feet of stone to each foot of length. The foundation might then be 7 or 8 feet wide at the bottom, 3 or 4 feet at the top and 5 or 6 feet deep. There has been some discussion over the matter of number of legs to a lathe, which has not yet been decided. Leave it undecided, and let the lathe bed begin where the stone ends. With suitable driving gear and a saddle weighing a ton or two, and a rest of half as much more, feeds something like the one used on the little shafts could be obtained, and the kind of work wanted by Passaic would be within reach. For a less expensive outfit I would suggest a rest like Fig. 3, to be used on any lathe that has the cross-slide Vs extending to the back of the saddle. A good way to make this rest is in two pieces, as shown in Fig. 4. It is not necessary to know the tensile strength of the iron used; just put in all you can find room for. Plane the tools, and hold them with a broad clamp. Let the bolts everywhere be about twice as big as needed. Keep the tool short, and advance the back bearing when small shafts are turned. Keep the bearings flat. Use $\frac{1}{2}$" to 1" feeds. The wooden lever and scrap iron to hold the shaft up may appear "primitive." I have tried to plan something better, but never succeeded. "Old Jones" used it 45 years ago, and he was a primitive man who never "got stuck." He never had any tools worth naming, and got along without. Some time I may tell how he cut an 18 foot, 3" diameter, 2 threads to 1" lead screw in a hand lathe, but not now. If the shaft don't sag more than an inch or so, no center bearing is required. If a center bearing must be used, make it of a V form and hang it to the ceiling. Of course a turn buckle will be handy for adjustment, and a "slip and go quick" arrangement for detaching

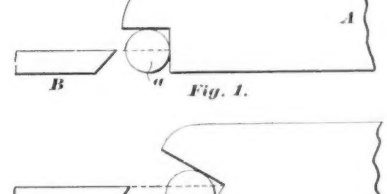


Fig. 1.

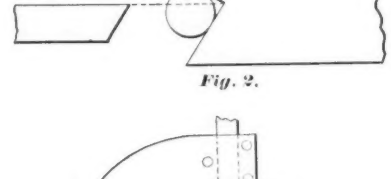


Fig. 2.

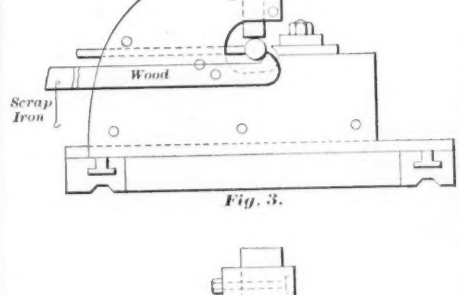


Fig. 3.

Fig. 4.

TURNING SHAFTING.

will also help. I mention feeds up to one inch, not because that is the limit, but because I have used them often and know just how it works. Passaic intimates that filing to size is common on lathe work, and not allowed on planer work. He seems to overlook the endless scraping resorted to to get planed work to fit. I guess more money is paid for scraping planed work than all the filing in lathes costs. There is a radical defect in all planers that I have ever seen, that prevents accurate cutting being done. There is not enough iron to resist the side strains in the frames, and there are too many loose joints. Taking one of the best makes of planers, I find 18" of iron *in two pieces* to resist the side strains, and 54" *in one piece* to resist the back strains. This 54" is formed in a beautiful parabolic curve. The 18" is parallel. The same maker sends out large lathe beds just as the planer leaves them. They illustrate the line:

"The wrinkled sea beneath him crawls."

It is not planing; just good chipping.

SUPERANNUATED.

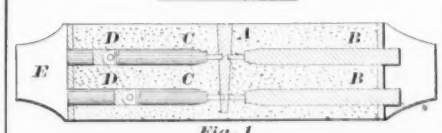


Fig. 1.

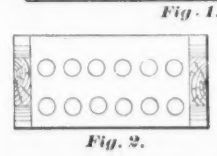


Fig. 2.

Fig. 3.

Making Sash Weights.

Editor American Machinist:

A new and novel method of making sash weights recently came to my notice, and thinking it might interest some of your many readers, especially those running small general jobbing foundries who are often called upon to make small orders of different sized weights, I give it to them herewith. The flask *E* is placed on the floor in some comparatively level place, and a little sand thrown in the middle. The gate *A* is then put in place and patterns *B B* slipped through the holes in the end of flask shown in Fig. 2, and inserted in sockets shown in *A*. The flask is then rammed level full and struck off, the gate *A* rapped a little and patterns *B B* drawn out, after which the gate *A* can be drawn and the eye chills *D D* put in place. Fig. 3 shows one half of eye chill, they of necessity being made in halves, so that they can readily be removed from the weights when cast. *C C*, Fig. 1, shows the mold with eye chills *D D* in place.

After putting eye chills in place, a few pieces of pig-iron placed on the top of flask will be all that is necessary to secure it for pouring. It can readily be seen from an examination of Fig. 1 that twenty four different length weights can be made in the same flask and at one cast, and in addition taking about half the room ordinarily used for the same number of weights, thus making it of special value to small foundries.

F. H. KORETKE.

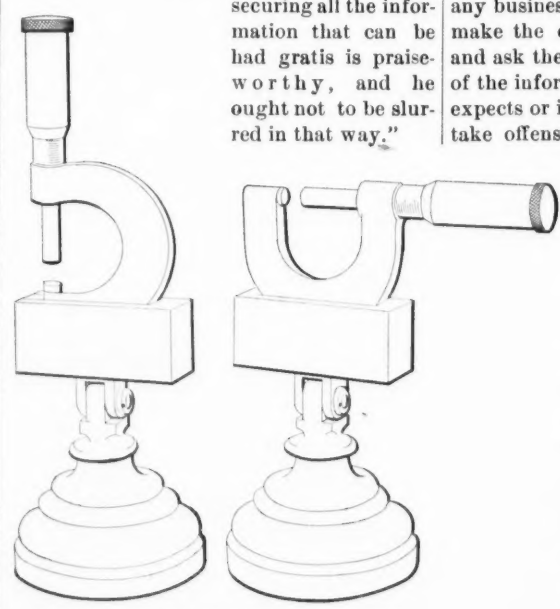
The Postal Card Fiend.

Editor American Machinist:

My perhaps injudicious remark concerning the "postal card fiend," quoted in your flattering notice of my "Gear Book for 1892," has provoked such a quantity and variety of praise, criticism and malediction from all parts of the country, that I am moved to enlarge upon the subject.

Some scold because I charge the horrible price of fifteen cents for a thing that is principally an advertisement; others take it as a matter of business, and frankly admit that they ought to pay for information in cash or in trade, while others say, "Good; that is what all manufacturers ought to do." I must confess myself unable to satisfy all these correspondents at the same time, but I can at least explain my position and give my definition of the obnoxious epithet.

"These postal card fiends," one correspondent says, "are mostly apprentices, boys who are learning their trade, and who will thank you now and pay when they grow up for any benefit they may get." Another remarks, "The motive of the workman in securing all the information that can be had gratis is praiseworthy, and he ought not to be slurred in that way."


STAND FOR MICROMETER.

That is all admitted without controversy, and I certainly did not intend to slur the honest student, rich or poor; but, can a manufacturer reasonably be expected to provide free text-books to apprentices and workmen whose motives are praiseworthy? Is he not as generous as he can be expected to be if he furnishes something of real value at cost? I say that the average manufacturer is earning his way quite as truly as the workman is earning his; has bills to pay, and thanks at fifteen cents each are not legal tender for that purpose. The prospect of payment "when they grow up" is rather dim, and is subject to the fact that the manufacturer is growing down, and would probably fail to realize on such a promissory note.

There is another side to this, as to most all questions. Any business man who has stood at the mailing end of the matter, and paid the printer and the postmaster, knows that the bulk of the thousands of his free catalogues that disappear into unlimited space do not go to worthy apprentices and workmen, but do go to that unmitigated nuisance, the collector; the urchin, under ten or over thirty, who is collecting postage stamps, business cards, calendars, and anything that can be had for the asking, and who takes to spoons, gone-by crockery, coins, wooden clocks, and old fiddles when his means permit. The object of this idler is not information, and he gets none, but to secure the largest possible pile of his particular hobby and beat other collectors.

Did you ever watch this humbug at a mechanic's fair? I have, and have followed him to some out-of-the-way corner to see him disgorge a peck of advertising matter and count the spoils. That was a good trip, my boy—eighty-seven catalogues for your mother to start the fire with next month. The printers ought to pay you a liberal salary.

There is another species of this bore, own brother to the collector—the bogus correspondent. He has no possible use for a steam engine, for example, but he has an abundance of time, and cash enough to pay postage, and deliberately writes in reply to dozens of steam engine advertisements. He never buys a steam engine, but he gets many pretty pictures, calendars, and typewritten letters, and ought to be jailed for obtaining valuable goods and wasting valuable time on false pretenses.

The merchant sees so much of his time and property go into this maw that he is suspicious of every postal card and letter that does not bear a printed business address, and either throws it away without ceremony, or pays the tax and calmly charges it to his paying customers. Some adopt the doubtful remedy of sending out such cheap and trashy matter that no beholder will covet it.

The remedy for this disease is simple. Make a catalogue that is worth selling, and then sell it to every applicant who cannot show an established business in its line. Allow a rebate of the amount paid in case any business should result, but mercilessly make the collector pay for his collection, and ask the student to pay at least the cost of the information furnished. No one who expects or intends ever to do business will take offense, and it matters little whether the others do or not.

GEORGE B. GRANT.

Lexington, Mass.

Stand for Micrometers.

Editor American Machinist:

The inclosed views of small stand are taken from a sample I made some time ago for my personal use. The following description of it might, perhaps, interest some readers of your esteemed paper.

Fine measuring tools, particularly micrometers, with no clamp screw to secure the setting, very often are found to be out of the original setting after taking them up for use. There is a stand in the market by which the tool is fastened with a thumb-screw, but still it takes two hands to secure the tool, which, in many cases, is not convenient when only one hand is free. To overcome this, and be able to handle the micrometer undisturbed and with only one hand, I designed the stand as accompanying views show. As in similar devices, it can be adjusted to the desired angles, but instead of fastening the micrometer by means of a set-screw, an automatic spring clamp, strong enough to hold the tool firmly, is used. The clamp is fastened to the bottom inside of the box-shaped top piece, and covered with leather, to prevent any scratching of the highly polished measuring instrument.

The horizontal position of the micrometer in the stand will make it convenient for bench work, whereas the vertical insertion

of the tool into the stand will be the most convenient for laying aside during machine work. As the sketches show, the stand is designed only for small micrometers, but can be readily changed to hold various sizes.

F. KIRCHNER.

Printing Press Cylinders.

Editor American Machinist:

Being somewhat interested lately in the articles on printing press cylinders, and having had quite some experience in that line the last few years, I am very much inclined to think that Messrs. Dingey and Cummings have had very little experience in making a general line of printing press cylinders. If they have had, they certainly would have adopted Mr. Brand's method in your issue of October 8, 1891, as the most economical and best way of making them. Any one who has had any experience at all in that line will know that there are a great many varieties of printing press cylinders; and, with a few exceptions, I cannot see how any one would make them any different from Mr. Brand's method. Mr. Dingey's method is all right for a plain cylinder under 10″ diameter. I would like to ask Messrs. Dingey and Cummings a few questions: for example, we will take an ordinary large cylinder, say 36″ diameter, 48″ long, cast-iron shaft, and with proper openings for rods and blankets, how to make it any different from Mr. Brand's method.

1st. To produce pattern and core-boxes with same amount of material.

2d. To lessen time of pattern-maker in producing same.

3d. To lessen time of molder in producing same.

4th. How to secure the cores properly in order to elevate your flask on end to pour it.

Our method of molding them is exactly the same as Mr. Brand's. If these gentlemen can suggest any better way by which we can save a dollar and produce equally as good a casting, we would be very thankful to hear from them.

Until I hear something further I must take sides with Mr. Brand.

F. S. TEMPLIN.

Proportions of Locomotive Cylinders.

Editor American Machinist:

Your correspondent F. W. Clough has considerable to say about the great advantages of short-stroke cylinders on locomotives, and concludes by hoping that no one will misunderstand his claims.

I am not a railroad mechanic, but I suppose I know something about engines, yet I think he will have to make his statements more consistent with known facts before he can get any one to understand what he claims.

To make a comparison of the power of locomotives it will be convenient to take the tractive force of the driver, or the tangential force applied at the circumference of the driving wheel, which would just equal the force on the piston, with one pound mean effective pressure per square inch in the cylinder.

For example, take the 16″x26″ cylinder, the area being 201 square inches, and while the driver makes one revolution the piston travels 52″. $201 \times 52 = 10{,}452$, and this divided by the circumference of the 60″ driver, $188\ 5'' = 55.4$ pounds tractive force. Calculated in the same way the 16″x26″ with 68″ driver = 49 pounds; the 18″x22″ with 60″ driver = 59.4 pounds; the 18″x22″ with 68″ driver = 52.4 pounds.

To make a fair comparison between any two cylinders it will be absolutely necessary to assume that the mean effective pressure be the same in both. I wish to note that Mr. Clough confidently asserts that the smaller diameter of driver will hold on to the rail the best, and we will take him at his word. He also gives the performance of a 16″x26″ cylinder on a 60″ driver, and an 18″x22″ cylinder on a 68″ driver, showing that the 18″ cylinder hauled eighty tons more than the 16″. The foregoing table shows that the 18″x22″ cylinder with the 68″ wheel has less tractive force than the 16″x26″ with a 60″ wheel, and it has the additional disadvantage that the larger wheel does not hold to the track as well as the smaller one; yet the 18″x22″ did one-fifth more work than the other, and he expects us to understand that it is all on account of the relatively shorter stroke. It is simply impossible for the 18″x22″ to get such results with the same mean effective pressure per square inch in the cylinder as used in the 16x26″, and I defy him to show us indicator cards that will prove that the same mean effective pressure was used in both, while hauling the loads stated.

He gives an instance where 16″x26″ locomotives with 68″ wheels were intended to do better service than the 18″x22″ with 68″ wheels. An inspection of the table shows that the 16″x26″ with 68″ wheels has 3.4 pounds less tractive force than the 18″x22″ with same size wheels; and whoever expected that the 16″x26″ would do better than the others with the same mean effective pressure might have known something about locomotives, but he knew trifling little about steam engines.

The fact is—and it cannot be too plainly stated—that the only possible difference in the power developed by a long or a short-stroke engine, other things being equal, is the difference in friction due to the different proportions; for it is a fact well known to all thoroughly informed mechanics that all the force exerted in the cylinder by the steam minus the friction of the engine, is delivered in power. The difference in friction between a 16″x26″ and an 18″x22″ would be so trifling that it could not be measured by any ordinary means, and it could never by any possibility be equal to one-fifth the power of the engine for any length of time, or it would melt the brasses.

Mr. Clough speaks of the indicator as though it was not of much account in making a comparison of two engines; but the question of the relative efficiency of long and short stroke locomotives cannot be decided without knowing the manner of the steam distribution in each cylinder, and if Mr. C. has any better method of doing it than with an indicator he had better make it known, for there are several thousand engineers who would appreciate it, and he might reap fame and some profit by so doing.

So far Mr. Clough has not given information on the subject that would enable an engineer to decide with certainty the relative efficiency of a long and short-stroke engine, and it will be useless for him to expect people to understand or believe his "claims" until he does so.

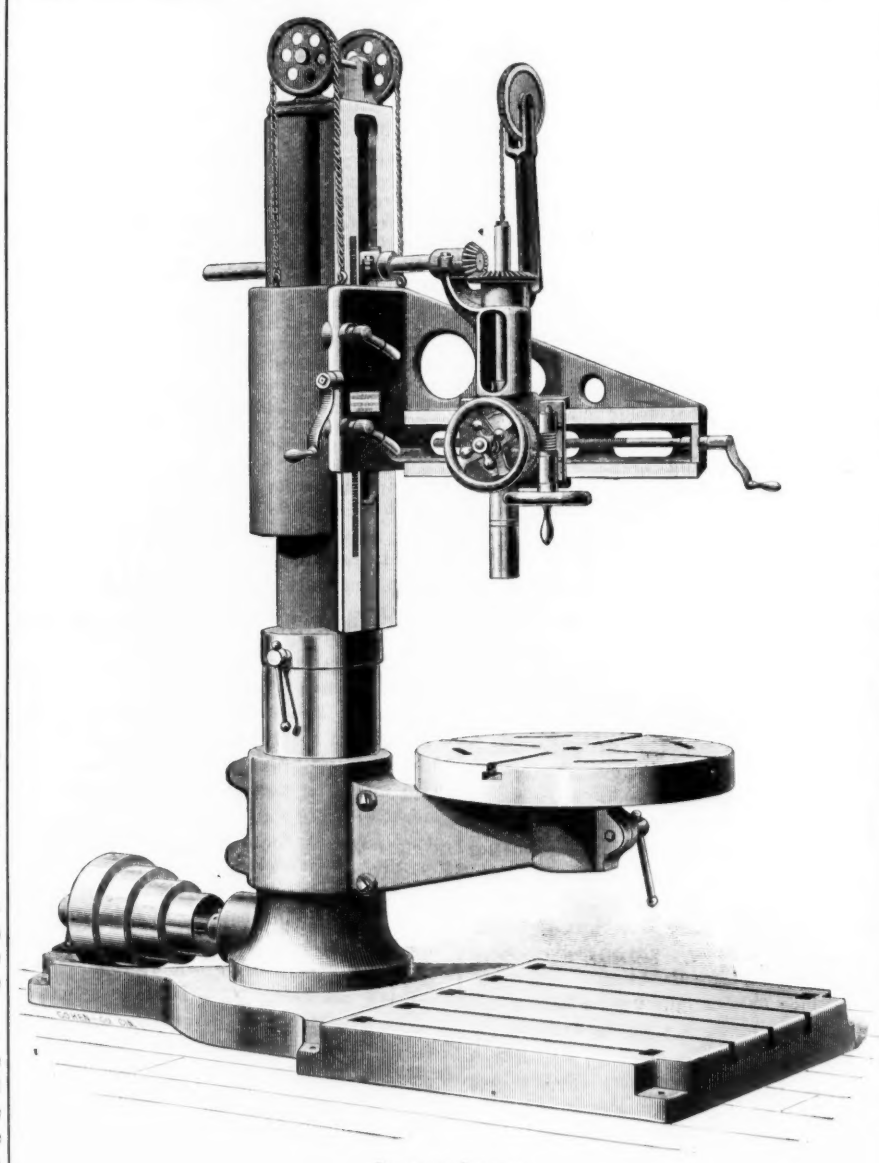
BELL CRANK.

Turning Paper.

Editor American Machinist:

In Question 102 J. H. S. asks for "the best kind of tool for turning paper." Almost any kind of a tool will turn paper. An ordinary diamond point does very well for roughing, and a broad, round nose, very sharp, for finishing. The tool must not have much clearance, or it will "dig in." The trouble with most people not accustomed to turning paper is, they run too fast. Speed the lathe a little faster than for cast-iron and there need be no difficulty.

F. STAMELEN.



RADIAL DRILL.

Radial Drill with Swinging Table.

The accompanying illustration is of a radial drill, in which some new features of interest are presented, the principal one being that the machine combines the swinging circular table of the ordinary upright drill press, with the swinging arm and adjustable head of the radial drill.

The arm is gibbed to the column, is counterbalanced by weights suspended at each side, and is raised or lowered easily by the hand crank seen at the left. The bolts for clamping it in position are fitted with lever nuts, so that the use of the wrench is avoided.

The swinging table is supported upon a stump which is permanently attached to the bed-plate, the table swinging completely around the column as usual. This stump extends up into the column above, and the column swings upon it to any desired position. The driving is from the cone pulley seen at the back through bevel gearing, and suitable vertical and horizontal shafts, the proportion of the gearing being such that the cone pulley revolves five turns to one of the spindle. Back gears are put on also when desired. Cone pulley is for a 3″ belt, and the largest step is 12″ diameter. Feed is simple and powerful, with quick return, and is made either automatic or by hand, as may be desired.

The column is 10″ diameter, 6 feet 6″ high. The arm has a vertical adjustment upon it of 28″. The machine drills to the center of 52″, receives under the spindle on the bed-plate 4 feet 4″, and on the floor 4 feet 9″. Spindle is $1\frac{9}{16}$″ diameter, bored to fit the Morse taper No. 3 or 4. The traverse of the spindle is 9″. Floor space required for base, 3 feet by 6 feet. Weight, 3,100 pounds. It is built by Dietz, Gang & Co., 58 and 60 Plum street, Cincinnati, Ohio.

At a lecture recently delivered before the Engineering Department of the Brooklyn Institute of Arts and Sciences by Prof. D. S. Jacobus, of the Stevens Institute of Technology, on Experimental Illustrations of the Principles and Properties of Substances Applied in Modern Refrigerating Machines, a general description of the several types of modern refrigerating machines was presented by the aid of lantern slides and working model.

Theoretical computations of the relative efficiencies and sizes of compression cylinders in machines employing different vapors were given, which were compared with results obtained by direct experiment.

It was shown that, if the effect of superheating of the gas during admission to the cylinder was included in the analysis, the theory agreed with the results obtained by experiment.

A theoretical comparison of the relative economy of absorption and compression ammonia machines was also presented; this was compared with results obtained by direct experiments in order to reduce it to a practical basis.

In this comparison it was shown that both the absorption and compression machine has its own particular field of usefulness in which it will possess the best economy, the absorption machine being theoretically ahead of the compression for low temperatures of brine and high temperatures of condensing water, and the compression ahead of the absorption for higher temperatures of brine and low temperatures of condensing water.

Near the close of the lecture experiments were made to show the boiling points at atmospheric pressure of the various volatile fluids used in refrigeration. Special experiments were made in which a freezing mixture colder than 100 degrees below zero Fahr. was employed.

The theoretical deductions were mainly abstracted from work now being prepared by Profs. Denton and Jacobus in revising Ledoux's work on Ice Making Machines, and from an article by the same authors in the *Stevens Indicator*, Jan., 1892.

An animated discussion followed, participated in by Profs. Alfred Mayer and De Volson Wood (of the Stevens Inst.), Dr. Charles E Emery, Ph.D., C. E.; Mr. C. W. Nason and Mr. Man (of the Sawyer-Man Electric Co.)

A boiler exploded a few days ago out in Ohio, instantly killing two men and wounding a dozen more, besides doing damage to the extent of $50,000 in property destroyed. It appears that the boiler had been lately examined by experts and pronounced in perfect condition. The conclusion likely to be arrived at is foreshadowed in the concluding sentence of a press dispatch in regard to the disaster. This sentence is as follows: "Was the explosive superheated steam, and if so, can its great power be made useful?" Superheated steam and various mysterious gases are made to cover the multitude of sins in a good many boiler explosions. Utilizing the "great power" of superheated steam is good.

It is said the output of petroleum in this country last year was 50,150,000 barrels.

AMERICAN MACHINIST

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Change of Location.

On May 1st, the AMERICAN MACHINIST offices will be moved about two blocks west from their present location to the new *Mail and Express* building, which fronts on Broadway, at No. 203, and on Fulton street, numbers 164–8. We shall then have increased room and better conveniences and facilities for carrying on our work.

Sending Catalogues.

The letter of Mr. Geo. B. Grant, on another page of this issue, shows again that there are two sides to almost every question, and that this matter of supplying catalogues upon request is no exception to the rule.

There is no doubt whatever that many catalogues are wasted, so far as any benefit to the manufacturer is concerned; but, on the other hand, there is no doubt that manufacturers frequently receive applications for catalogues written upon plain letter paper, and signed by unfamiliar names, where it would pay well to send the catalogue as promptly as possible.

It frequently happens that young mechanics working together in a shop make up their minds to go into business. They naturally wish to get prices and all the information possible regarding tools and equipment generally. They write for catalogues upon plain paper, and nothing can be more certain than that their request should receive some attention in some form, and the worst possible thing that can be done with the letter is to throw it into the waste basket unanswered because it does not bear the printed letter-head of a business firm. It frequently happens, too, that mechanics who occupy leading positions in shops are endeavoring to have improved machinery put in for doing certain work. Before saying anything on the subject to their employer, they wish to investigate the matter fully for themselves, so that when it is presented to the employer it can be done in a complete manner, the relative merits and adaptabilities of the different machines on the market explained, their approximate cost given, and the degree of improvement that may reasonably be expected from the adoption of some one or more of them. Such men are very apt to write for information upon plain letter paper, or even postal cards, and no inquiries received by a manufacturer are better worthy of attention. The trouble is to distinguish between such inquiries as these and those of the mere collectors or idlers, who, as Mr. Grant says, are after everything that can be had for the asking.

And since it is usually impossible to distinguish, the question then becomes which course to adopt. To send to all alike, a good catalogue, or the poorest one that can be produced; to pay no attention to requests for catalogues not written on the letter-heads of business firms, or to charge a small price, sufficient to cover the cost of production and mailing. We are not prepared to say which of these plans is the best one, but we are prepared to say without hesitation which is the worst, and that is, to send only to business firms; paying no attention to the others. Some firms adopt the plan of dividing their catalogues into a number of pamphlets, each treating of a separate line of machines. Thus when an inquiry comes in for a certain machine or line of machines, that particular pamphlet is sent at small expense, and the applicant gets what he wants, and is often better suited than he would be with a larger catalogue. Again, others adopt the plan of making their catalogues as small and inexpensive as possible, yet of good quality, and sending one in answer to every demand, without distinction. No one who has been much in machine shops can doubt that one firm at least gets a great deal of valuable advertising from the circumstance that its small and condensed catalogue is to be found in the tool chests of so many machinists, and that it is so frequently referred to in the shops, when machine tools, gear wheels, etc., of which it treats are being discussed. This firm which we have in mind advertises that its catalogue will be sent to any address upon application. This is one plan, and in this case, at least, is found to work well. It might not work so well with others differently situated, and in any event the subject is one which is worth some attention. Any plan is better, however, in our opinion, than getting out poor and cheap catalogues, or ignoring requests for catalogues not written on letter-heads of business firms.

A Decision in a Patent Case.

A decision of some importance to inventors and others using patented devices has recently been rendered. The elevated railroads of this city have, it seems, been using an improvement in couplings, the patent on which was owned by the Campbell Printing Press and Mfg. Co., who sued for infringement and an injunction restraining the road from using the device. The railroad company claimed that the improvement was of little if any pecuniary value, and that if it were enjoined from using it, hardship and inconvenience to the public would result—statements which seem to be rather contradictory. Judge Lacombe in his opinion says:

The proposition advanced by the defendant is, practically, that, if an inventor whose improvement of locomotive machinery, although valid, is of but trifling value to a common carrier, himself thinks it valuable, and therefore demands a license fee for its use higher than such common carriers as would like to use it are willing to pay, they may nevertheless appropriate his invention to their use, may place it on their cars and locomotives without his permission, and may continue to use it until it wears out, without interference, on the ground that to remove it would inconvenience the public, and that for such enforced license they should be made to pay, not the fee which the inventor asks, but such sum as a master of the court may think the invention worth.

The judge declared that such a qualification of the monopoly secured by patent rights was not warranted by any law upon the statute books, nor by decisions bearing upon the matter. The injunction was granted, and it was ordered that the device must be removed from a certain number of cars each week until all are removed. It is becoming too common for railroad companies to assume that the proper thing for them to do in the matter of patents is to use the thing patented if they want it, and then resist or refuse payment for the use of it, finally letting the courts decide whether they have anything to pay or not, and, if so, then how much, counting, of course, in many cases, upon being able to tire out inventors who are not financially strong enough to "hire their law by the year." In this case the road encountered a company able to follow it up in the courts, and have the thing finally decided upon its merits.

It is not often that a temperance address takes the form of an eulogium of machinery and of the modern industrial system, but it seems that Judge N. M. Hubbard, in a temperance address delivered at a dinner of business men, took the position that the chief force tending towards temperance at the present time was the use of machinery and the organization of the modern industrial and business establishment. This he thought resulted from the fact that the modern conditions, care of machinery, division of labor by which the continuous work of one or more men depends upon the continuous working of one or more other men, required that each should be reliable. It is becoming better understood every day that railroad employes from the president to the section men must be sober, and that the lives of travelers as well as their own depend upon their being so. He declared that "the self-binder and mower and the steam thresher have banished whisky from the farms." He thought that temperance reform was coming through the business necessities of the country, and by the forcing out of employment and out of business those who allowed themselves to reduce their efficiency by intemperance.

Literary Notes.

HOW TO RUN ENGINES AND BOILERS. Practical Instructions for Young Engineers and Steam Users. By Egbert Pomeroy Watson, Editor and Proprietor of The *Engineer*. Author of "Modern Practice of American Machinists and Engineers," "Manual of the Hand Lathe," "The Professor in the Machine Shop," etc.

Young engineers and steam users will find in this little book of 125 pages valuable information of a thoroughly practical character, which all should possess. The young engineer is told what to do in taking charge of an engine and boiler, new or old; and the mode of procedure to keep them in good working order is clearly given. Cleaning of boilers, examining the various parts of the engine, setting of eccentrics, adjustment of bearings, cause of pounding, and light repairs are among the subjects treated. The whole is very plainly written; it bears ample evidence of the author's experience, and a perusal cannot fail to interest and be instructive to the reader. The book is published by the author, 150 Nassau street, New York. Price $1.50 by mail.

MILLING MACHINES AND PROCESSES. By Paul Hasluck. London: Crosby, Lockwood & Son New York: Van Nostrand & Co.

This is a book of some 350 pages, devoted entirely to the subjects indicated by the title, profusely illustrated, and yet the experienced milling machine man, especially if he has kept himself well posted on the literature of the subject as it has appeared, especially in the columns of this paper, will find very little in the book that is really new to him.

The author's work has been chiefly one of compilation, in the doing of which he has shown an extended acquaintance with what has been published on the subject from time to time, rather than an intimate practical acquaintance with milling machines and milling operations. Much of the discussion of the principles underlying the successful practice of milling as found in the book will have a familiar sound to readers of this journal, notably that relating to the degree of skill required to manage milling machines; the relation between size of cutters, rotative speed and feeds; importance of cutter, grinding machines, etc.; while of the engravings of special devices used with milling machines, but not regularly manufactured for the market, many are reproduced from our columns, among others being the paper washer cutter contributed by Mr. John J. Grant to our columns some years ago, and the method of fastening face cutters to an arbor without threading them, contributed by the present reviewer. The fact that ideas, and in many cases exact language have been taken from our columns does not necessarily detract from its value, but some little acknowledgment would have been appropriate, it seems to us, especially in view of the fact that, at the close of the last chapter, the author says that much of the matter in it was contributed by him anonymously to a recent issue of *Engineering*, of London; that extracts from it have been freely printed in mechanical journals, and he therefore thinks it advisable to claim the authorship in order to avoid misunderstanding. Considerable of the matter of this same chapter, we cannot doubt, was derived from our columns, especially that which relates to a discussion of the principles involved in deciding the proper number of teeth to give to a cutter. We are not complaining of this nor accusing the author of intentional injustice, but we think that where others' matter is so extensively used some specific or at least general acknowledgment should be made. Nearly all types of milling machines by all the principal builders of this country and of England are discussed, and much useful information is given, the value of the work being chiefly in the fact that it is a gathering together in one book of much that has been published on the subject, so that the mechanic or engineer unacquainted with it can find what he wants in convenient form, the very full and complete index being of great assistance in this. Those who are interested in milling machines will find the book convenient as a reference, while those who are

unfamiliar with them will find much valuable information in it. Its price in England is 12s. 6d., and in this country $5.

QUESTIONS AND ANSWERS.

Questions of general interest relating to subjects discussed in our columns will receive attention in this department. The writer's name and address should always accompany the question. Neither correct initials nor location will be published when there is a request to that effect. If questions are enclosed with a business communication, they should be written on a separate sheet.

(127) T. H. M., Detroit, Mich., asks: What is the cost per pound to melt iron? *A.*—That will depend on the intelligence of the person who has charge of the cupola, and the quantity to be melted.

(128) M. S. C., Orono, Me., writes: Please inform me where I can obtain a practical work on millwright work, also one on pattern making. *A.*—You can obtain these from any dealer in industrial and scientific works. Write to them for catalogues.

(129) J. D., Philadelphia, Pa., writes: Be kind enough to state the horse-power of a vertical triple-expansion marine engine. High-pressure cylinder is 36 inches diameter; intermediate, 42 inches; and low-pressure, 72 inches diameter; stroke, 42 inches; boiler pressure, 160 pounds; number of revolutions per minute, 130. *A.*—We should estimate it at 3,800 indicated horse-power.

(130) H. D. T., Rochester, N. Y., writes: Please give me through your columns the name of a book which explains the construction of a marine upright plain slide valve engine; also give name and address of publisher, and price. *A.*—Manual of Marine Engineering, by A. E. Seaton; published by D. Van Nostrand Company, 23 Murray and 27 Warren streets, New York. Price, $5.

(131) E. L. H., Bloomfield, N. J., writes: Kindly settle a dispute: A rope belt travels at the rate of 5,000 feet per minute, and has a belt tightener on its pulling part. F. says this is correct, but E. wants the belt tightener on the slack or loose part of the belt. Who is right? *A.*—The tightening pulley should be placed on the slack side of the belt, by so doing, the arc of contact will be increased and friction reduced. This is practically the universal practice.

(132) L. C., Philadelphia, Pa., asks: 1. Can a steel casting be hardened as hard as machinery steel can? *A.*—What is termed machinery steel cannot be hardened except by some case-hardening process. Steel castings, when made to be hardened, can be hardened by the ordinary processes used in hardening tool steel. 2. Has wrought-iron ever been thoroughly hardened? *A.*—Wrought-iron may be case-hardened so as to be very hard on the surface and to a limited depth. If the pieces are thin the hardening may extend quite through them.

(133) C. C. Hill, Marissa, Ill., writes: I have been running a hoisting engine for the past eight years. The cylinder is 10 inches in diameter; stroke, 36 inches; the pinion is 11 inches; the spur wheel 60 inches, and drum 62 inches diameter; boiler pressure, 60 pounds. Now we are going to put in an 18-inch pinion and a 72-inch spur wheel. Drum is to be increased to 64 inches diameter. I claim that the boiler pressure will not be sufficient to do the work. *A.*—With the change of gearing and drum you can lift a load about 28 per cent. less than with the old arrangement. The amount of work to be done will depend on the steaming capacity of the boiler. 2. How many revolutions will the drum make, and how many will the crank make to raise the load through 134 feet? *A.*—With the new arrangement the drum will make

$$\frac{134}{\text{circ. of drum}} = \frac{134}{16.75} = 8 \text{ revolutions.}$$

The pinion will make 4 revolutions while the spur wheel makes one; hence the number of revolutions of the crank will be $8 \times 4 = 32$ revolutions in the same time, or during the time that the load is raised 134 feet. This result will be somewhat changed by taking the thickness of the rope into account, which should have been added to the diameter of the drum; but since you did not give this thickness we had to neglect it.

(134) J. F. G., Kansas City, Mo., asks: If the cylinder of a steam engine could be kept as hot as the steam at the initial pressure, would there be any cylinder condensation? *A.*—No. 2. If there was no cylinder condensation would a single cylinder be as economical as a compound? *A.*—In many compound engines the stress due to the initial pressure is better distributed than in a simple engine, which gives the compound engine an advantage. Taking everything into consideration, we believe that the compound engine will give the best results. 3. What would the constant temperature of the cylinder have to be to prevent condensation, using steam at 100 pounds pressure? *A.*—The temperature will have to be equal to that of the steam at 100 pounds pressure, 340 degrees. To this we may add: do not attempt it; the results will not be satisfactory, even if it is possible to do so. 4. Does a tandem compound give as good results as a cross-compound? *A.*—That depends much on their construction. 5. For some time I have been studying on an engine having four valves arranged as in the Corliss engine. The valves are perfectly balanced so that they move easily, and they are operated by a positive gear which opens and closes them suddenly. The opening and closing may take place at any point wherever the best results can be obtained. The exhaust valve does not open until the piston is very near the end of the stroke, say from $\frac{1}{2}$ to $1\frac{1}{2}$ inches, according to the size of engine, when it opens suddenly to its full width and remains wide open until the point of closing is reached. All the valves operate in this way. I would like to have your opinion about such an engine. Would it give as good results as the very best of engines now on the market? Would it give any better results? The valves are controlled by an automatic governor. *A.*—The given conditions of operating the valves are those of the best kind of engines that can be built; but whether it will be superior to the many excellent engines now on the market will depend on the means employed to obtain the ideal valve motion; the complication of the mechanism may be such as to destroy the advantages gained.

(135) S. W., Charlestown, N. H., writes: In your answer to H. S., Cedar Keys, why do you not use the simpler rule, that the area is as the square of the diameter? In his case 2 inches is just 8 times $\frac{1}{4}$, and $8 \times 8 = 64$; and avoid the inconvenient and incorrect practice due to trying to use decimals. *A.*—We endeavored to show the principle upon which such computations are based; the method adopted is applicable to any form of hole. We admit that the simpler rule should have been given, but we over looked it at the time. The simpler rule is: Divide the square of the diameter of the large hole by the square of the diameter of the small one. Thus, the square of 2 inches is 4, and the square of $\frac{1}{4}$ is $\frac{1}{16}$ and $4 \div \frac{1}{16} = 64$ holes for the answer. Of course this rule is only applicable to circular holes, whereas the one we have given can be applied to any form of holes, and is not incorrect. Both rules will, in this case, give the same answer, provided the number of ciphers in the decimal are carried out far enough. 2. In your answer to J. F., St. Louis, relating to the horse-power of shafts, you give the obsolete formula $H = \frac{D^3 \times R}{125}$. Nobody thinks of this now; $H = \frac{D^3 \times R}{100}$ is the formula used for prime movers subject to heavy strains; and for cold rolled iron $\frac{D^3 \times R}{62}$ is ample, also for steel. *A.*—The difference between the two formulas lies simply in the divisor, and in regard to this authorities vary greatly. Formulas of this kind are based on average conditions, and should not be indiscriminately applied; good judgment should be used in choosing the divisor. The formula given in the answer referred to we have frequently used, and still use with satisfactory results.

(136) E. H. T., Philadelphia, Pa., writes: I would like you to give a rule for finding the diameter and width of face of a pulley required to transmit a given power. *A.*—Let W denote the width of belt in inches; D the diameter of pulley in inches; R the revolutions per minute; H the horse-power that can be transmitted by the belt. Then, the horse power to be transmitted and the diameter of the pulley being given, the width of belt, and consequently the width of face of the pulley, is found by the following formulas:

SINGLE BELT.	DOUBLE BELT.
$W = \frac{H \times 2{,}750}{D \times R}$	$W = \frac{H \times 1{,}925}{D \times R}$

The horse-power and width of belt being given, to find the diameter of the pulley:

SINGLE BELT.	DOUBLE BELT.
$D = \frac{H \times 2{,}750}{R \times W}$	$D = \frac{H \times 1{,}925}{R \times W}$

The horse-power, diameter of the pulley and width of belt being given, to find the number of revolutions necessary:

SINGLE BELT.	DOUBLE BELT.
$R = \frac{H \times 2{,}750}{D \times W}$	$R = \frac{H \times 1{,}925}{D \times W}$

In these rules it has been assumed that the belts are open, the pulleys of equal diameters, and the arc of contact is the semi-circumference. If, however, the pulleys are of different diameters, and the arc of contact is less than the semi-circumference, the rules must be modified accordingly, by using in place of the above constants the following ones, which will cover every case likely to occur in practice. When the arc of contact of the smaller pulley is:

	CONSTANT.	
	SINGLE BELT.	DOUBLE BELT.
$\frac{1}{4}$ of circumference	6,080	4,250
$\frac{5}{16}$ "	4,730	3,310
$\frac{3}{8}$ "	4,400	3,080
$\frac{7}{16}$ "	3,850	2,700
$\frac{1}{2}$ "	3,410	2,390
$\frac{9}{16}$ "	3,220	2,250

If the belt is crossed and the arc of contact is greater than the semi-circumference, of course, more power could be transmitted by the pulley; but only by increasing the tension so as to overtax the belt. These rules have been taken from "Useful Information" for engineers, published by Jones & Laughlins. 2. I put on a new pulley on a shaft $2\frac{15}{16}$ inches in diameter. The old pulley was 12 inches in diameter; the new one was increased to 18 inches diameter, so as to get more power; width of face 18 inches, hubs in center keyed to shaft 12 feet long. The shaft was in perfect alignment, but in starting up it would not stay in line, and would be pulled from 1 to 2 inches towards the line shaft. I claim that there should have been two pulleys in place of one 18 inches wide, because the countershaft never had the belt in the center, but always to one side, to suit the tight and loose pulleys run by it, which causes the unequal load, pulling the shaft out of line. Am I right? *A.*—By putting the pulley closer to a bearing the strain in the shaft will be reduced. We believe that your trouble is caused by having the bearings too far apart.

(137) E. W., Shantontown, O., writes: I have been running engines about eight years, and I would like to get a good book that treats on engines, and a paper that will keep me posted on the different kinds of engines built, so that, if I am called upon to run an engine with a valve gear different from those with which I am familiar, I will have some knowledge of it beforehand. I have never studied any of the higher branches of arithmetic, and I would like something that explains the valve motion of engines in plain language. *A.*—It seems to us that the Text-Book on Steam and Steam Engines, by Prof. A. Jamieson, may suit your purpose; it can be obtained from any dealer in scientific works. This book is elementary in character, but unless you have a fair knowledge of arithmetic and the elementary principles of algebra you may have some difficulty in understanding it. To make good progress in study of the steam engine requires, at least in the beginning, a knowledge of the elementary branches of mathematics, and if you have not this knowledge we see no other way for you to pursue than to acquire it; if you go about it in a systematic manner, and follow the course indicated in the article, "How to Study and What to Study," given in our issue of February 19, 1891, you will have no difficulty in making good progress, and you will be greatly benefited. We always endeavor to illustrate and describe the latest types of all kinds of engines built, and these illustrations should keep you posted. Another good idea is to obtain catalogues from manufacturers of engines; many of these contain valuable information, besides details of construction. 2. I wish to make a small engine, say with cylinder two inches diameter and four inches stroke, with an ordinary slide valve, which I think will help me and give me a fair understanding of an engine. Please explain how to find the dimensions of the ports, valves, and how to find the point of cut off when the lap is known. Also explain how to find the size of shaft, crank, length of connecting rod, etc., you will know what I will need. I will pay you whatever you may charge for your trouble. *A.*—We never accept any kind of remuneration for answering questions, or for giving any kind of information in our power to give. The designing of a valve does not require any computation, it can all be laid out on the drawing board, and how to do so has been thoroughly explained in our issues October 10, 24, November 7, 21, and December 12, 1885. Although in these papers locomotive valves are considered only, yet the same processes of laying out a valve, finding the lap for any given cut-off, or for finding the cut-off for a given amount of lap, are applicable to slide valves of any class of engine. No rigid rules for determining the dimensions of the different parts of an engine as small as you propose to make can be given, as practical considerations will often modify the rules used for larger engines to a greater or less extent. The following dimensions we simply give as a guide: Steam ports, $\frac{1}{4}$ inch wide by 1 inch long; exhaust port, $\frac{1}{2}$x1 inch; diameter of piston, $\frac{3}{4}$ inch; length of connecting rod, 9 inches; diameter of connecting rod at neck, $\frac{3}{8}$ inch; diameter of shaft, 1 inch; diameter of overhanging crank-pin, $\frac{1}{2}$ inch; crank, $\frac{3}{4}$ inch thick and $2\frac{1}{2}$ inches wide at the center of the shaft. Our advice is, do not waste your time in trying to build this engine, but devote your spare time to study.

BUSINESS SPECIALS

Transient Advertisements 50 cents a line for each insertion under this head. About seven words make a line. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue.

Note the cat on page 20.

Shafting Straighteners. J. H. Wells, Tampa, Fla.

Forming Lathes, Mer. Mach. Tool Co., Meriden, Ct.

Ideal Drawing Stands. M. C. Hammett, Troy, N.Y.

A. D. Pentz, Consulting. Tools, Elizabeth, N. J.

See Gage advertisement below.

"Bradley's Power Hammers, the best in the world." 20 sizes. Bradley & Co., Syracuse, N. Y.

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Selden Packing for stuffing-box, with or without rubber core. Randolph Brandt, 38 Cortlandt St., N.Y.

S. A Smith, 23 S. Canal St., Chicago, Ill., is agent for Holbrook's new loaded rawhide mallets.

Send for sample pages of "Barrus Boiler Tests," to Gowing & Co., Mason Building, Boston, Mass.

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Save small iron from foundry refuse. It pays Use the Woodruff Pat. Separating Machine, Audubon Machine Works, New Haven, Conn.

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For best Return Steam Traps, Pressure Regulators, Positive-Acting Pump Govs., Back-Pressure Valves. T. Kieley, 11 W. 13th St., N.Y. Send for des'n.

For the Latest Improved Diamond Prospecting Drill, address the M. C. Bullock Mfg. Co., 138 Jackson St., Chicago, Ill.

25" / 32" / 37" / 42" — "Only Drill Press built on 'Ko-rekt' principles,' Even if they come from Jersey." Gould & Eberhardt, New Ark, N. J.

Complete treatise on Screws and Screw-making with clear and concise explanation of the methods: 95 illustrations. Price, $1.25 postpaid. E. & F. N Spon, 12 Cortlandt St., N. Y.

S. W. Card & Co., Mansfield, Mass., are putting on the market a new line of stocks and dies, with their patent adjustable dies and guide S. A. Smith, 23 S. Canal Street, Chicago, Ill, western agent.

What do you want to buy? We will send without cost to you, catalogues, price lists, and information concerning anything you wish. Paret, Willey & Co., 265 Broadway, N. Y.

Patent Soliciting of High Class.
D. Walter Brown, Counsel in Patent Cases.
31 Nassau street, New York.
Send for Brief History of Patent Legislation.

We will pay 15 cents each for copies of the AMERICAN MACHINIST of December 25, 1886 issue; must be unsoiled, and in good condition. AMERICAN MACHINIST PUBLISHING COMPANY 96 Fulton Street, New York.

De Lamater Screw Propeller Wheel, made only by The Samuel L. Moore & Sons Co., Elizabethport, N. J., who have purchased from C. H. De Lamater & Co., New York, all their patterns, books of record, gauges, etc. Location and equipment well adapted for Heavy Steamship Repairs.

"Binders" for the AMERICAN MACHINIST. Two styles—the "Common Sense," as heretofore sold by us, and mailed to any address at $1.00 each, and the "New Handy," mailed at 50c. each. The former has stiff board covers, while the latter has flexible covers with full page opening flat. Either will hold the entire 52 issues of any volume. American Machinist Publishing Co., 96 Fulton St., New York.

"Indicator Practice and Steam Engine Economy." By F. F. Hemenway. Contains plain directions for using the indicator and making all required calculations from the diagram, also the principles of economy in operating steam engines and current practice in testing engines and boilers. Price, $2 postpaid. Published by John Wiley & Sons, 53 East Tenth Street, New York.

Tool Room Kinks.

BY FRED H. COLVIN.

The tool maker in the small shop is usually a busy man, with little time to put any extra finish on tools, or, in fact, do anything that is not necessary for their good behavior at their work. This is usually due to the fact that the tool maker in the said shop has a multitude of duties; everything in the tool and machine line falls to his lot, and it may be safely said that, as a rule, he has more to look after, in proportion to the size of the shop, than the tool maker in the larger establishments. So it often happens that a visitor to the small shop goes away thinking that the tool maker there does not amount to much, because his tools looked rough, were not polished up as nicely as some he had seen elsewhere, and there seemed to be a lack of finish generally. Such opinions are rather unjust, as are many opinions that are formed before all the circumstances are considered, and a careful study will show that this same tool maker can turn out just as fine work as his brother in the large place when he has the time.

There are shops, and quite prominent ones, too, where you will find many of the tool-boring bars and the like, finely finished and then "stoned"; they look very pretty on the shelves, and there is nothing I admire more than nice work; but does this pay?

It is not to be supposed that they will turn out any better work than the plain bars, provided that they are finished smooth enough, so as not to mar or scratch the work. Taking this for granted, and I think it will not be disputed, is not the extra work wasted time? As far as the working portions of the tool are concerned, the work cannot be too accurate, and should be as finely finished as necessary; but any unnecessary work has no place in the small tool room—there is too much to be done. I believe that the grinding attachment for the engine lathe is not yet appreciated, and not enough used on tool work. This part of the work is necessary many times, as in hardening the tools they sometimes change their shape and size, and to produce accurate work they should be ground to size after hardening. For an inexpensive attachment they cannot be beaten for usefulness, and with a few wheels of different sizes and grades of emery a great variety of work can be satisfactorily done on it.

For tempering small tools there seems to be nothing more convenient than the Bunsen burner in any of its most approved forms; it is a handy method, and avoids the heat and nuisance from a coal fire. As you often see men tempering with one of these, and as often see them hold the piece to be tempered in a different part of the flame, it suggested itself to me that, to satisfy myself, it might be a good plan to test the heat of the various parts of the flame. Procuring a piece of carbon pencil, such as the lamp trimmers drop in the streets whenever they trim the lamps, the hottest parts of the flame became readily visible. By noting the degree of incandescence, and moving the carbon around in the flame, the difference can be readily noticed, and it will be found that the upper portions are ordinarily the hottest. I say ordinarily, because there is a point in the flame where the amount of heat becomes less; at the very end of the tips on the wings the air counteracts the heat below, and the carbon did not retain its bright glow. This knowledge may be of use in tempering pieces of unequal sizes. By holding the piece so that the larger portions are in the hottest parts of the flame, and the smaller portions less exposed to heat, a more even drawing of temper is likely to be obtained.

For holding small pieces of work during the operation of drawing the temper many devices will suggest themselves to the user, and for special work different tongs or pliers may be necessary. The tweezers or pliers shown in Fig. 1 came to me as a "windfall," among a lot of old tools that had been bought cheap for what could be got out of them. Much has been done with these shown. As will be seen, they are of the self closing type, and for small work they are the handiest kind of pliers to use; the spring is strong enough to hold any of the work firmly, and it is a big relief to the hand, for it becomes tiresome to hold a pair of tweezers together while watching for the colors to "run." The ends can be shaped to suit the work. Those shown do very well for small round work, and also for flat work of moderately small size, as the notched side is spoon-shaped, and has two ears side by side, about $\frac{3}{8}$ of an inch apart, holding the flat work quite firmly.

Some time ago—four or five years, I think—I illustrated a little tool that I had made and found very useful; since then new uses have made themselves known, and one of them is shown in the accompanying cut. This tool, Fig. 2, is a small square made of about $\frac{1}{4}$ inch steel, and the movable blade is made from thinner steel. As shown, the blade is slotted for nearly the full length. Beside being useful as a center square, it can be used in laying out various kinds of work, and has the advantage of duplicating the marks whenever it is correctly set. By this I mean that by setting the tool in any position, the one shown for example, the same relative position can be obtained at any point on the piece by revolving the tool into the required position. Taking the work shown, that of laying out the dovetail or half dovetail, to be planed in the piece to receive a cutter, by revolving the tool half round the work a line parallel to the one drawn can then be scribed. The piece can first be scribed at right angles, which will form the center lines, then as shown for the bottom of the cuts, then, by adjusting the blade to the proper position, the straight sides may be drawn, after which the slant side can be easily obtained. Any order of operation can be followed; there is nothing arbitrary in its operation.

In chasing threads, especially small inside threads, there is a good deal of uncertainty as to what is really going on inside the die, or whatever it is you are chasing, and even when the work is of fairly large diameter there is apt to be a misunderstanding that sometimes causes trouble. Unless the work is large enough for you to get inside of, there is no real certainty as to the shape of the thread, and as to whether it is sharp on the bottom or not. This is annoying, to say

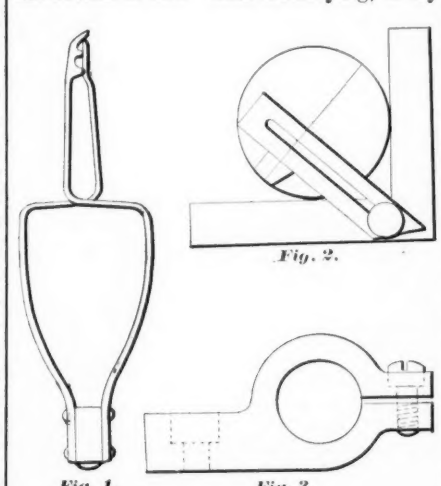

Fig. 1. *Fig. 2.* *Fig. 3.*

TOOL ROOM KINKS.

the least, and especially so when the work is of a particular nature; in such cases, I have found considerable relief, by the use of a small mirror, taken internally by the work. There are two uses for the small mirror in this connection, first to reflect the condition of the thread, so that you can see what it looks like; and secondly, to reflect light into the interior of the work, so as to better illuminate the thread itself; either of these duties requires a good quality of glass. The reflection of light in such cases need not be confined to die work, for there are often times when it can be advantageously used to determine the condition of the interior of holes in work, and this part is not confined to the tool room by any means. As for the reflection, it is very often accurate enough to tell whether the thread is perfect or not, depending upon the quality of the mirror, but even with the best of mirrors there is a feeling of security obtained by looking at the thread itself, and, when possible, the reflected light will be found the most desirable. However, the reflected image is not to be despised, and will be found of great assistance in many cases. For small work it is usually necessary to have a long narrow glass so as to reach into the small holes, though the reflection of the work cannot be depended upon after it is distorted by looking at the mirror at an acute angle, so, after all, these mirrors are mostly good for the reflection of the light itself. Probably a lens would concentrate the light so as to be even more brilliant upon the interior, and for some work it might pay to rig up a lens and mirror, but for the ordinary tool room that is a little farther than they can go, the mirror is not expensive, and does good work when rightly used, or more properly speaking, it assists the production of good work by aiding the workman to see the work in hand.

As repairing usually seems to be a part of the duties of the small shop tool makers, a kink in repairing the slide rest usually used by Fox lathes may be useful to some of them. This is only applicable to the slide rests that use the V thread for the screw—either the regular V or some modification of it; it is not applicable to the square thread screw. The nut that is fastened to the carriage of the slide rest is usually of brass, and soon wears so as to become slack sideways, which is very annoying to the operator, and a new nut is in order very soon, before the old one has hardly got used to traveling back and forth. Not quite as bad as that, but they seem to wear very quickly, and it was to lengthen their useful life that the following kink was devised. The nut is made as usual, excepting it has the projection or lug cast on the side, though the position of this is immaterial; it can be changed to suit circumstances, which in some cases will not allow of its being in the position shown.

After tapping, as usual, and otherwise fitting if necessary, the lug is slotted as shown, and tapped for the binding screw as shown. The object is apparent; as soon as the nut becomes loose enough to annoy the operator, it is tightened and brought closer to the screw, bearing, it is true, upon the tops of the threads, but taking up the lost motion to a great extent.

It is true this may add to the wear of the screw, and perhaps it does, but as the screws always wear unevenly, *i. e.*, wear in the center, as that is usually more used than any other portion, it is necessary to replace the screws in order to have the slide rest work as nicely as when new, and the additional wear cannot be noticed. It may not be correct practice, but it lengthens the life of the nut considerably, and does not materially shorten the life of the screw.

Before closing, it may be of interest to mention an emery wheel "truing" that I witnessed in a small tool room. There was a grinding machine of the regular pattern with two wheels mounted for tool grinding, and as wheels will, they had become out of truth to a limited extent, not very much, but enough to cause unpleasantness when grinding. There was no truing device in the place, and not likely to be, so the tool maker tried the grindstone business, used a piece of gas pipe, and made quite a job of it, too. Sometimes the wheels would cut the pipe, and refuses to be trued; then the pipe would get a grip and take a good slice of the high part before it would let go; but he finally got there, and the wheels were trued very nicely, though not as sharp probably as though a wheel device had been used.

This is not advocated as a model way of truing an emery wheel, but merely as a hint to those who may be placed in similar circumstances; it is not a pleasant job, but it trues the wheel, and that was the desired end.

MANUFACTURES.

Keely Bros., Goshen, Ind., will operate a machine shop in connection with their foundry.

It is stated that the Grand Forks (Wis.) Boiler Works may be removed to Superior, Wis.

It is probable that Mary L. D'Este will erect a 115x45 foot brick machine shop in Boston, Mass.

Plans have been adopted for the new waterworks at Ticonderoga, N. Y.; estimated cost, $50,000.

A new company is reported as to be organized, for the erection of an electric light plant, at Piedmont, Ala.

The Vanderbilt Sash Balance Company, of Canandaigua, N. Y., has been incorporated, with a capital of $10,000.

The Somerton Tin-plate Works, of Brooklyn, is nearing completion, and will be put in operation about May 1st.

The Athens Foundry and Machine Company have been incorporated, at Athens, Ohio, with a capital stock of $50,000.

D. W. R. Read, Lynchburg, Va., will erect either in Virginia or West Virginia a plant for the manufacture of foundry facings.

The Rock Island Automatic Car Journal Lubricator Co. has been incorporated at Rock Island, Ill. Capital stock, $100,000.

Schleicher, Schumm & Co., builders of the Otto gas engine, Philadelphia, Pa., have opened an office at 19 Pearl street, Boston, Mass.

The Central Iron Works, of Harrisburg, Pa., are erecting a new building, 300x75 feet, of iron, in which boiler plate will be made.

A company with a capital of $25,000 has been organized, to manufacture drawn steel and keys for machinery, at New Brighton, Pa.

The Albany Steam Trap Company, Albany, N. Y. has received and shipped a large order of valves to Slaviansk, Govt. of Kharkoff, Russia.

A company with a capital stock of $50,000 has been formed at Beaver Falls, Pa., for manufacturing drawn steel under the Moltrop patents.

J. W. Anthoine has, it is stated, erected shops for the manufacture of cotton presses, pumps, cotton planters, plows, etc., at Fort Valley, Fla.

The Appalachian Steel and Iron Company expects to get one of its furnaces at Big Stone Gap, Va., in blast about the last of this month.

The Triple Wire Nail Machine Company, of Parkersburg, W. Va., has closed contract for the removal of its entire plant to Bridgeport, Ala.

The Phelps Manufacturing Comyany has been incorporated, at San Francisco, Cal., with a capital of $300,000, to manufacture iron, steel, etc.

The Union Iron Works and Shipbuilding Company, of San Francisco, have acquired the Pacific Iron Works, with its large and complete plant.

H. B. Birtwell, of Philadelphia, has, it is stated purchased the entire machinery, engines and boilers of the Preston Flat Rock Mill at Manayunk, Pa.

The Valley Machine Company, 1100 to 1114 South Tilden avenue, Saginaw, E. S., Mich., have succeeded the Giant Key seater Company, of that place.

The Elliston Manufacturing Co., of Elliston, Va., is to rebuild its machine shops, lately burned, and will need a full line of general machinery and shop tools.

Subscriptions to the amount of $80,000 have been made for the purpose of securing the erection of the Delano Iron and Steel Works at Tacoma Wash.

The Ironton (O.) *Register* says that the engines are being put in shape at the Eagle Rolling-mill, and that the lower part of the mill will be running by April 1.

A company has been organized at Upper Sandusky, O., with a capital stock of $100,000, for the purpose of manufacturing fuel and illuminating gas plants.

At Chicago, Ill., the Northern Steel Co. has been incorporated with a capital of $200,000. The incorporators are F. C. Caldwell, M. M. Naramore and Ralph W. King.

The People's Ice Factory, paid up capital $25,000, has purchased the Sam Kagle ice factory, Yazoo City, Miss., and will improve it by putting in a new 10-ton ice machine.

The British Columbia Iron Works Company at Victoria, B. C., are making a 50 foot addition to their molding department, and a 60x50 addition to their machine shop.

The Lansing (Mich.) Iron and Engine Works are closed for the annual inventory. During the shutdown extensive repairs and alterations will be made about the plant.

The Meriden Bronze Co., at Hartford, Conn., has increased its capital from $50,000 to $65,000, by using 600 additional shares of $25 each, $5,000 of which has been paid in cash.

The Babcock Printing Press Manufacturing Company's works, New London, Conn., New York office, Tribune Building, has issued a catalogue of printing presses, quite fully illustrated.

The Walburn-Swenson Manufacturing Company, of Fort Scott, Kan., has erected a small experimental concentrating plant, with a capacity of 10 to 20 tons per day, for the purpose of testing ores.

The Birmingham (Ala.) Bolt and Nut Company, recently incorporated, has erected the necessary buildings for its plant, and is now placing machinery. Operations will be commenced during the month.

Charles Nrachen, who, before the fire that burned down the Thos. D. West Foundry, was renting part of the building, is about to build a pattern shop on Hamilton street, east of Case avenue, Cleveland, Ohio.

The Liddell Company, Charlotte, N. C., manufacturers of steam engines, boilers, saw-mills, cotton and yarn presses, shafting, hangers, pulleys, etc., has issued an illustrated catalogue for general distribution.

The Safety Brake Shoe Constructing Company, at Portland, Me., has been organized, with a capital stock of $500,000. The object of the company is to manufacture and deal in all kinds of shoes for car and engine wheels.

The City Council, of Waukegan, Ill., is discussing and agitating the question of putting in a water system. The prevailing idea seems to be to take water from Lake Michigan and distribute a thorough system of pipes throughout the city.

The Skinner Chuck Company, New Britain, Conn., inform us that they have done a much larger business since January last than at any equal period of time in the history of the company. Special machinery has been built to increase the output.

A charter has been issued to the Acme Iron Company, of Norristown, Pa. The capital is $75,000, and the directors are Isaac McHose, Reading; Edwin R. Mann and Frank Samuel, Philadelphia; Ambrose A. McHose and Wilson McHose, Norristown.

Geo. V. Cresson, Philadelphia shafting works, manufacturer of power-transmitting machinery, shafting and its appurtenances, Eighteenth street and Allegheny avenue, Philadelphia, Pa., has issued a new illustrated price list, which is to supersede all previous issues.

F. P. Budden and Wm. E. Volz have organized a company, to build and repair the Lighthall Surface condensers, and also combined surface condensers and feed-water heaters. The title of the company that has been formed is: Standard Condenser Co.; office, 15 State street, New York.

One of our subscribers, Mr. J. A. O'Donnell, in Zacatecas, Mexico, writes us that he has been away prospecting, and has discovered a 16-foot vein of coal. He does not say where, but we congratulate him on his good fortune, just the same, and hope the "vein" will soon be requiring machinery.

D. Van Nostrand Company, 23 Murray street and 27 Warren street, P. O. Box 1741, New York, will issue their complete catalogue of scientific books in sections. Parts I and II, treating respectively of steam and mechanical engineering, and electricity and magnetism, are now ready and will be sent upon application.

W. D. Forbes & Co., engineers and manufacturers, 1300 Hudson street, Hoboken, N. J., have issued a catalogue of milling cutters and forming tools for various purposes, cutting-off tools, mandrels, countersinks, etc. This company also design and build special tools and machinery for any required purpose

There is water-works agitation in Rapid City, Dak.; Jamaica, L. I.; Haverhill, Mass.; Greensburg, Pa.; Lisbon Falls, Me.; Hanover, Pa.; Yoakum, Texas; Westfield, Pa.; Woonsocket, R. I.; Ticonderoga, N. Y.; Bozeman, Mont.; Montoursville, Pa.; Salineville, Ohio; Guthrie, Okla.; Crowell, Tex; Renville, Minn.; Dayton, Wash.

George L. Seth and Wilfred Brook will build a foundry and machine shop near the crossing of Detroit street and Lake Shore R. R., to be called the West Cleveland (Ohio) Foundry and Machine Shop. Seth and Brook are two practical men in their trades, having worked for some years for the Walker Manufacturing Company. Their capital stock is $10,000.

It is stated that negotiations have been concluded at Duluth, Minn., for the erection of a structural steel plant, to manufacture steel beams, bridge work, and angle and I bars of every size. It is agreed that $350,000 shall be spent in the initial construction of the plant, which shall have a capacity of 200 tons of open hearth steel per day. James E. York will be the general manager of the new enterprise.

John Kirkaldy, 40 West India Dock, London, has issued a very complete and interesting illustrated catalogue of his "Compactum" Patented Specialties. These specialties consist of condensers, distillers for a variety of purposes, evaporators, feed-water heaters for marine and factory engines, feed make-up apparatus, pumps for various purposes in factories and ships, etc. The catalogue contains a large amount of general information, tables, etc., that will interest engineers and others.

The Buffalo Forge Company, Buffalo, N. Y., have just issued a new catalogue of their Steel Plate Planing-mill Exhausters, which have recently been materially improved in construction. A feature of the catalogue is the large number of hood diagrams and forms of connections for wood-working machinery from actual measurements of successful plants, which have been installed by this company. The catalogue is issued in convenient form for mailing, on 80-pound coated paper, and printed in art ink.

Benj. F. Kelley & Son, 91 Liberty street, New York, continuing in a line similar to that which we noticed a short time since, have issued a second pamphlet, entitled "A Wise Father's Method of Selecting the Most Able of His Sons to Succeed Him." The one who made the best showing was, according to the narrative, the one who used a Berryman feed-water heater. The pamphlet contains a large number of commendatory letters from the users of this heater, for which the firm named are agents.

The Southwark Foundry and Machine Company, Washington avenue and Fifth street, Philadelphia, Pa., sole makers of the Porter-Allen steam engine, has issued a new circular, giving, by the aid of numerous cuts and reading matter, a most complete description of this engine as a whole, and in all its important details. In addition, very full information is given in regard to setting and running the engine. The illustrations are excellent, the paper of a high quality, and the typographical work fine. Altogether, it is one of the finest catalogues issued. Sent free on application.

Machinists' Supplies and Iron.

NEW YORK, March 26, 1892.

Iron—American Pig—We quote Standard Northern brands, No. 1 Foundry, $16.50 to $17.50; No. 2, $15.25 to $16.50; Grey Forge, $14 to $14.50. Southern brands of good quality are obtainable at $15.75 to $17 for No. 1 Foundry; $15 to $16 for No. 2; and $13.50 to $14 for Grey Forge.

Scotch Pig—Coltness is quoted at $21; and $20.25 for Eglington.

Antimony—The market is stronger.

We quote Hallett's, 10⅞c. to 11c.; Cookson's, 14½c. to 15c.; and L. X., 13c. to 13½c.

Copper—The market has an unsettled appearance. For Lake Copper 12.15c. to 12¼c. is asked. Casting Copper is held at 11¾c. to 12c.

Lead—The situation is dull, but slightly firmer. Holders are asking 4.25c., and buyers seem disposed to pay 4.15c. Speculative interest is stagnant.

Lard Oil—The market is firm at 56c. to 57c. for Prime City. Western on spot is quoted at 55c. to 56c.

Spelter—There has been some business done at 4.50c. by the carload for New York delivery. But the best bid is 4.45c. for New York delivery.

Tin—The market has improved; there have been sales of 25 tons at 20.02½c. for March delivery, and 20c. is freely bid.

WANTED

"Situation and Help" Advertisements only inserted under this head. Rate 30 cents a line for each insertion. Seven words make a line, and the address as desired to appear should be included. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Draftsman wants situation. Practice, AM. MACH.

Three first-class tool makers wanted by the Ottumwa Iron Works, Ottumwa, Iowa.

Wanted—By young mechanical draftsman, position; two years' experience. P. S., AM. MACH.

Wanted—Position by mechanical draftsman. New York or Brooklyn; references. B. C., AM. MACH.

Wanted—Sit. by young prac. mech. engineer, good designer & comp. draftsman. Canadian, AM. MACH.

Engineer is open for eng. as supt. of erection of industrial plants. Box 53, AMERICAN MACHINIST.

Wanted—Position as chief draftsman or assistant superintendent. Tech. graduate; 12 years' exp. on gen. mach'y in above positions. Box 83, AM. MACH.

Wanted—Position as traveling salesman by practical machinist, American; 2 years on the road; engines or other machinery pref'd. Box 43, AM. MACH.

Mechanical engineer and draftsman will represent machinery firm in Philadelphia. Steam machinery or machine tools. U. S. N., AM. MACH.

A young man (25) wants position as ass't engineer; has N. Y. license; good lathe hand and draftsman. S. W., AMERICAN MACHINIST.

Wanted—Position as draftsman by an apprenticed mechanic, with tech. education and exp. in drafting-room; age, 23. W. L. S., AM. MACHINIST.

Wanted—An intelligent, steady young mechanic, to take charge of iron pattern dept. Must be familiar with cored work. The H. B. Smith Co., Westfield, Mass.

Wanted—First-class foreman pattern maker for shop of eight to ten men. Must be able to "get there," and not by the longest road. Address Box 81, care AMERICAN MACHINIST.

Wanted—By a first-class machinist, a position as superintendent of works where he could invest some money in the business. Address "Excelsior," care AMERICAN MACHINIST.

Wanted—A pattern maker who is also a fair draftsman. Must be bright, active and reliable. Address, stating references, age, and wages expected, "Motor," AMERICAN MACHINIST.

Wanted—Man of 32, with long and successful experience as machinist, foreman and supt., good draftsman and designer of tools and mach'y, wants situation about May 1. "Ability," care AM. MACH.

Wanted—First-class machinery salesman for Chicago and vicinity; must be well up in machine tools; a good place for the right party with one of the largest manufacturers in the U. S. Address "Masheen," care AMERICAN MACHINIST.

Wanted—Position as supt. or foreman, by a young man, successful in the systematic manufacture of machinery and mechanical devices, and in the economical management of men; a designer and draftsman of automatic and interchangeable machinery, tools, jigs, etc. W. S. H., AMERICAN MACHINIST.

Wanted—Position as draftsman or in charge by a draftsman and pattern maker. Well up in general shop practice. Accustomed to handling men. Familiar with job and duplicate work, jigs and templates, smith and foundry work. First-class references; will go anywhere. Address Tangent, Fulton Foundry, Virginia, Nev.

A practical and well educated machinist, who at present holds a responsible position in a typewriter manufacturing concern, desires to make a change. Have had a large and varied experience on the duplicating of interchanging parts, and in the construction of automatic screw machinery. Address J. W. H., care AMERICAN MACHINIST.

A mechanical engineer, technical graduate, in good position now, speaking Spanish and French fluently, well experienced in Cuban sugar plantation mach'y, desires change with parties doing business with Cuba or other country, direct or indirect. Can act as correspondent, translator, salesman, sup't'd erection, and draftsman. X. Y. Z., AM. MACH.

Wanted—A young man for foreman or superintendent of machine department, who has had practical experience in our line, and is up in modern shop practices of producing interchangeable work in quantities, accurately and at low cost. A. L. Ide & Son, builders of high-speed engines, Springfield, Ill.

A prac. and educated mech. eng., who has successfully filled positions of charge and responsibility in mfg. concerns, is open for engagement; good executive; well up in modern mach. shop practice and labor-saving devices; also in economical production of duplicate and interchangeable parts; exp'd in adapting old and originating new mach'y and methods to decrease cost of production; can take charge of the erection of a plant from ground up, including equipment. Progressive, AM. MACH.

MISCELLANEOUS WANTS

Advertisements will be inserted under this head at 35 cents per line, each insertion. Copy should be sent to reach us not later than Saturday morning for the ensuing week's issue. Answers addressed to our care will be forwarded.

Cheap 2d hd-lathes & planers. S. M. York, Clev'd, O

Auto. Steam Flue Cleaners. Kelley Co., Erie, Pa.

Best Crank Shaper $225. Am. Tool Wks., Clev., O.

Wanted—Specialties to build for the Southern trade. Bluefield Iron Works, Bluefield, W. Va.

Engines, special and gen. mach'y designed; ideas developed. A. W. Jacobi, 136 Liberty St., N. Y.

Special machinery designed and built. C. F. Langston & Co., 70 N. 4th St., Philadelphia.

Light and fine machinery to order; Foot Lathe Catalogue for stamp. E. O. Chase, Newark, N. J.

Best Bolt Header in the world for $50. Address C. H. Baush & Sons, Holyoke, Mass.

Mechanics send for price lists of tools manufactured by Fred. A. Welles, Milwaukee, Wis.

Complete mach'y for mfg. horseshoes delivered by L. Ingermann, Minden, Westphalia, Germany.

For Sale—A general engineering office in New York City; last year's earnings, $3,000; good location; bright prospects. Price, $600 cash. Address Box 82, AMERICAN MACHINIST.

To Capitalists—Valuable patent boiler either for sale or form stock company; big orders ahead. Address Box 71, care AMERICAN MACHINIST.

Wanted—Hardware specialties to build. Send 25 cents for "Eureka Knife and Shears Sharpener." W. A. Smith & Co., 227 Eddy Street, Providence, R. I.

Wanted—Engineers to write for catalogue of all the latest and most valuable mechanical, scientific and electrical books which are given free with each barrel of the Pittsburgh Boiler Scale Resolvent, Pittsburgh Boiler Scale Resolvent Co., Pittsb'gh, Pa.

For Sale—A size "F" 45 inch diam. Collian cupola. Has never been used, and is now ready to deliver complete with fire brick lining, base, frame, etc., all ready for use. Will make a very low figure. Address The Congdon Brake Shoe Co., 518 Phenix Building, Chicago, Ill.

Wanted an iron foundry willing to undertake the delivery of the iron parts for our Patent Schomburg Firing and inclined to represent our Technical Office for Firings. Address direct to H. Schömburg & Söhne, Berlin-Moabit, Germany.

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One Pond Planer 30"x30"x6', with cross, down, and angle self-acting feeds, countershaft and wrenches, complete in all respects. In strictly first-class order. Wish to sell to replace with larger planer. Price, f. o. b. cars Big Rapids, $525.00.
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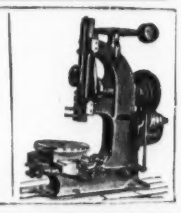

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Wanted—An energetic, practical man as partner and manager of a new engine company; must have experience in selling engines; cap'l required $30,000; give refs., age, etc. M. Ulrich, Florence, Mass.

Bound volumes for 1891. We are now prepared to take orders. Price, $4.00 per volume; express charges payable by purchaser. Address AMERICAN MACHINIST, 96 Fulton street, New York.

For Sale, Cheap.—A foundry and general repair shops will be sold so as to make it a special inducement to the purchaser, in order to settle the estate of its recent proprietor. Wish to complete a sale by the first week in April. Come and see what a bargain is to be had, or address Helen I. Woodworth, Admin, Nunda, N. Y. Fifty farm bells for sale cheap. Automatic steam flue cleaner patent for sale. Address as above.

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Machinery and Machinery Castings OF ALL KINDS.

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38 do	17 ft.	bed. New		Fifield
30 do	14	do do		do
30 do	24	do do		
27 do	16	do do		
24 do	12	do do		Fifield
24 do	12	do do		Fitchburg
24 do	12	do do		Flather
22 do	10	do New Pattern		Fifield
22 do	12	do do		do
22 do	12	do New		Blaisdell
22 do	8	do do		Flather
22 do	10	do do		do
20 do	8	do do		do
20 do	10	do do		do
18 do	8	do do		do
18 do	10	do do		do
18 do	8	do do		Blaisdell
18 do	10	do do		do
16 do	6	do do		Flather
16 do	6	do do		Blaisdell
15 do	6	do do		Flather
14 do	8	do do		do
14 do	6	do do		Blaisdell
12 do	6	do do		do

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42 in. wide,	42 in.	high,	12 ft. long, 2 heads	Gleason
36 do	36	do	8 do	Pease
30 do	30	do	8 do	do
30 do	30	do	8 do	Whitcomb
30 do	30	do	8 do	Flather
26 do	26	do	6 do	do
24 do	24	do	6 do	do
24 do	24	do	6 do	Whitcomb
22 do	22	do	5 do	do
22 do	22	do	6 do	Flather

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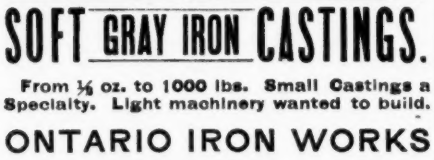

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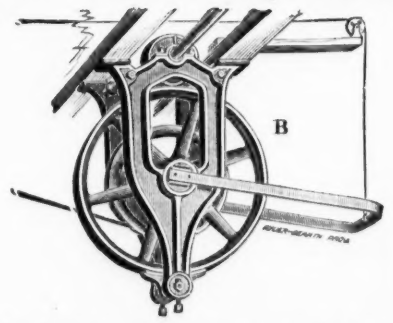

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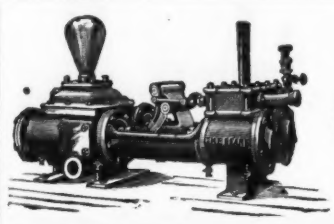

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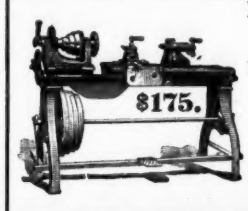

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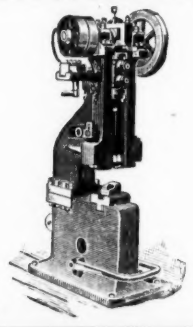

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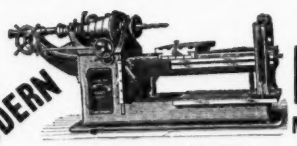

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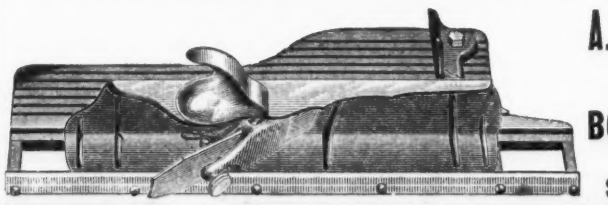

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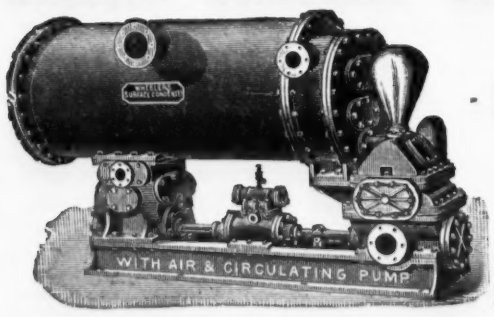

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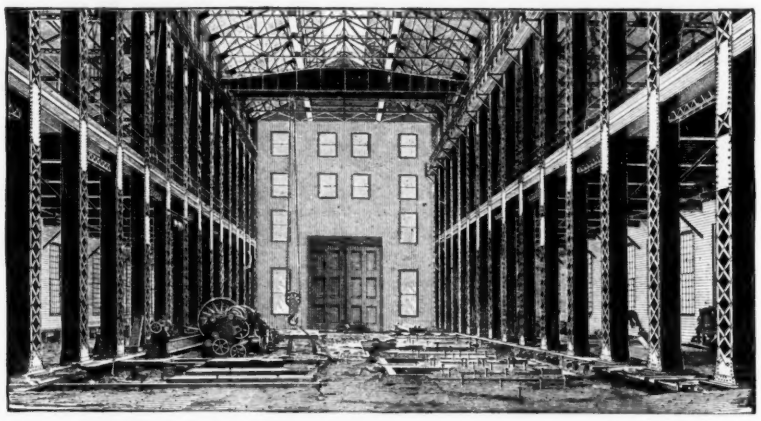

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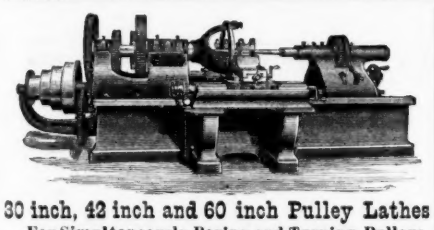

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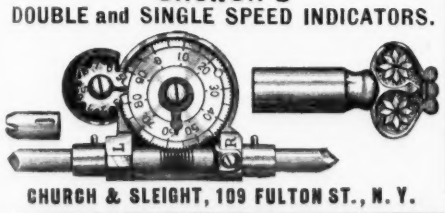

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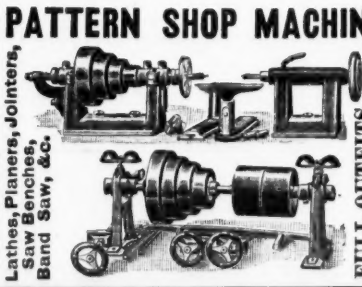

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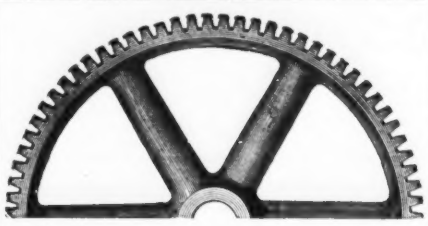

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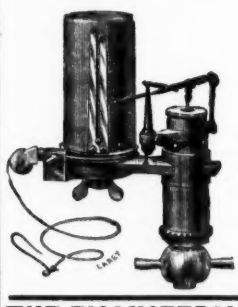

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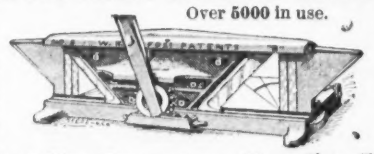

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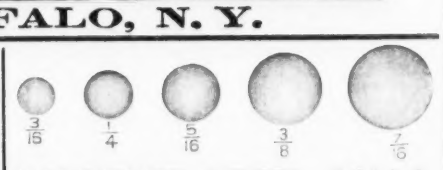

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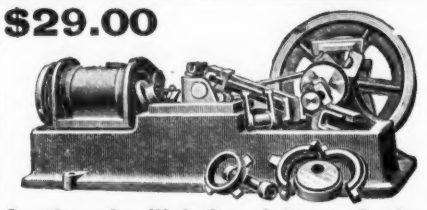

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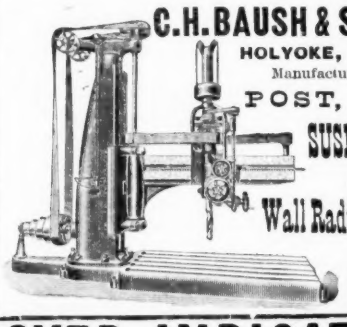

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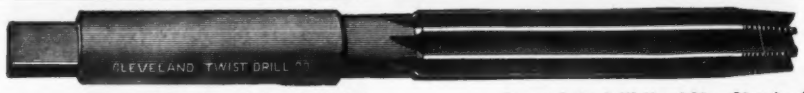

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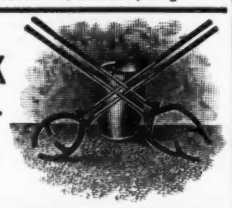

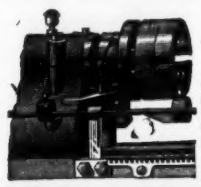

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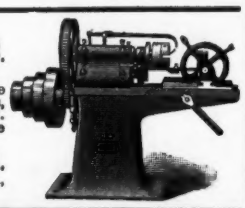

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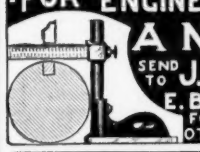

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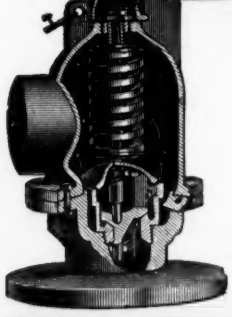

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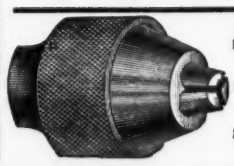

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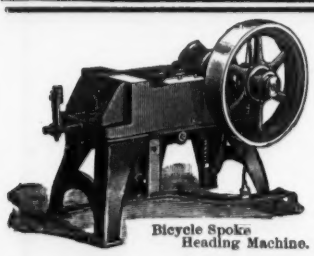

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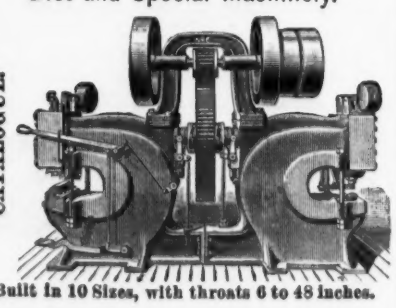

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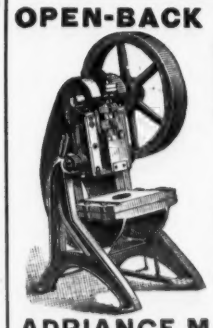

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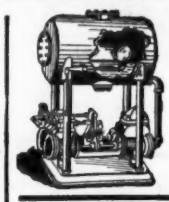

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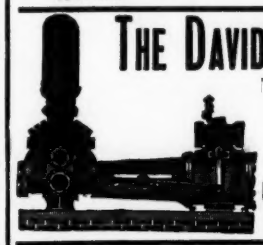

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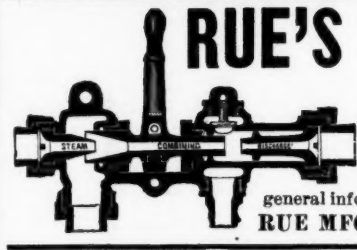

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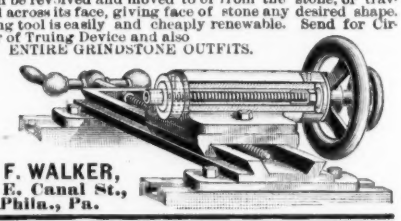

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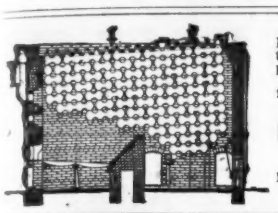

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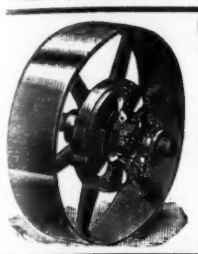

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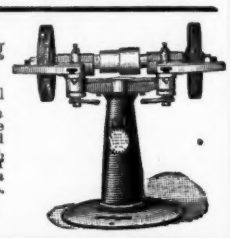

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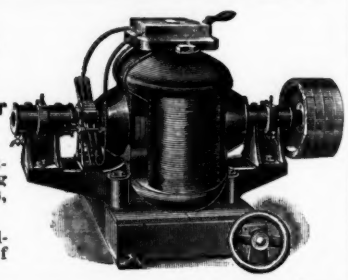

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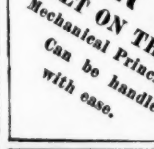

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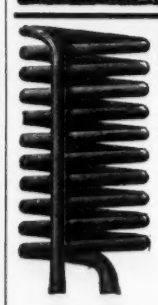

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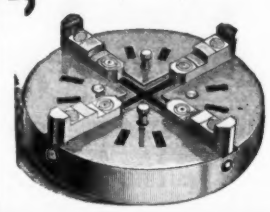

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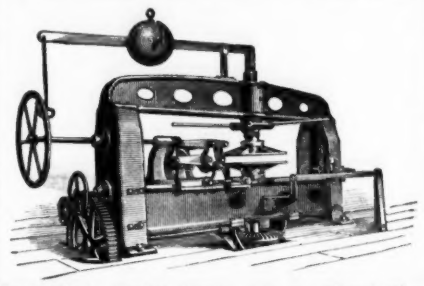

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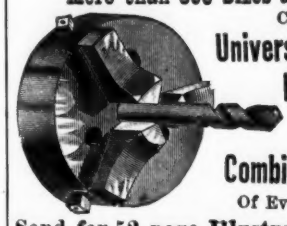

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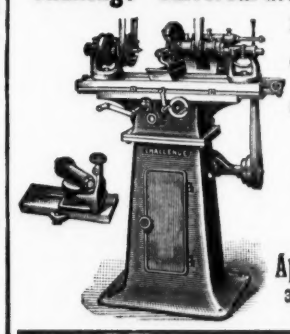

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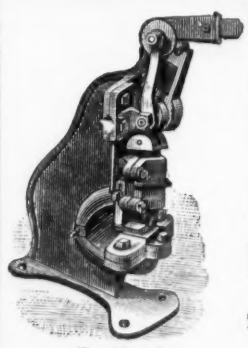

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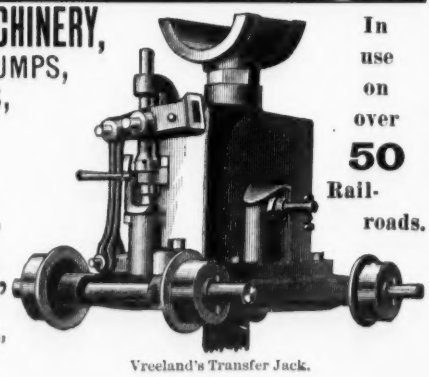

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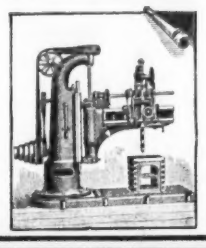

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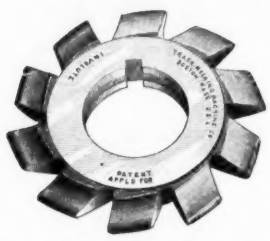

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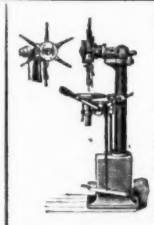

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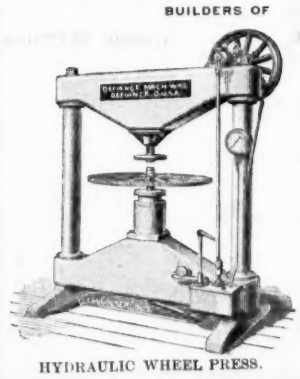

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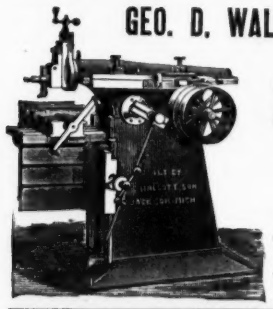

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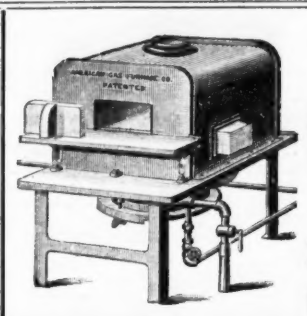

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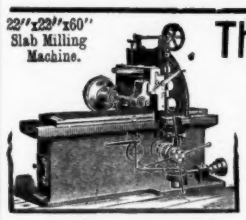

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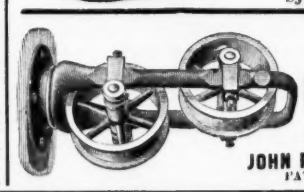

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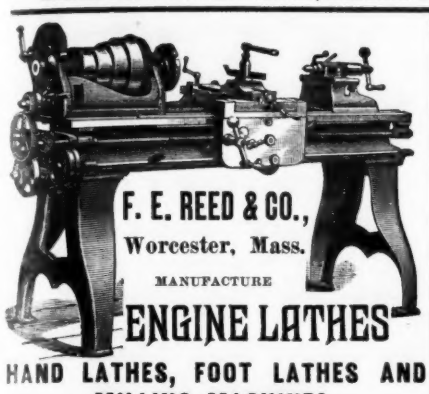

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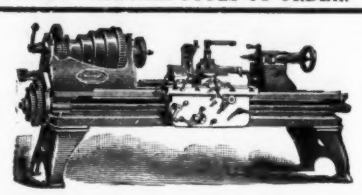

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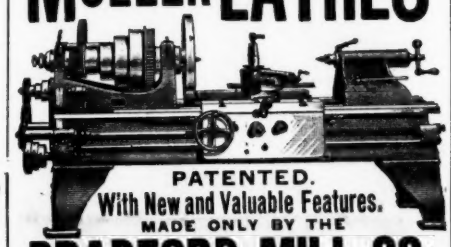

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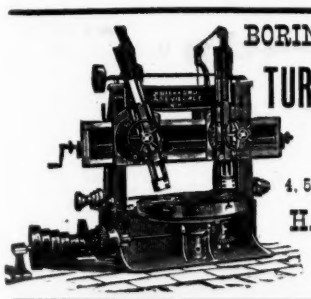

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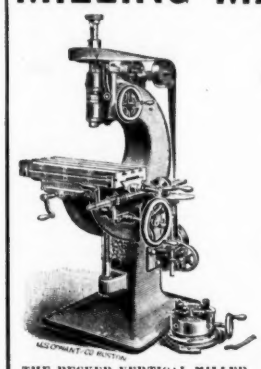

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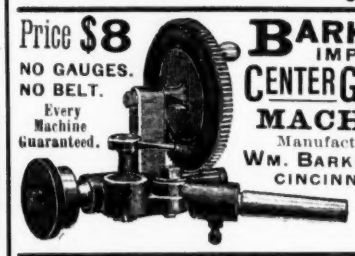

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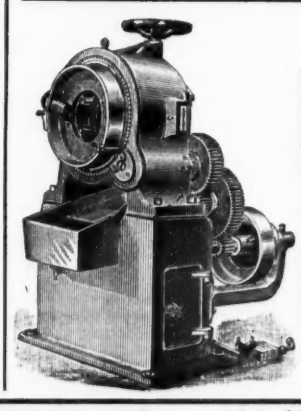
Yours very truly,
JOHN KRUESI,
Gen'l Manager.



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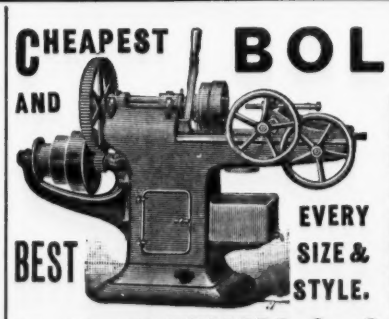

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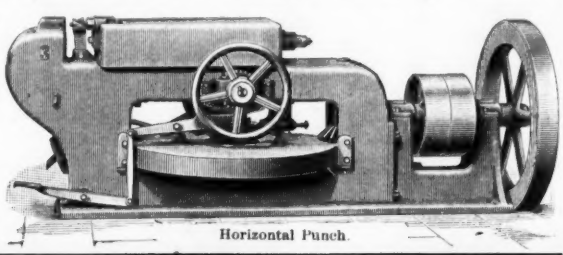
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Very respectfully,
CHAS. L. HILDRETH, Superintendent.
LOWELL MACHINE SHOP,
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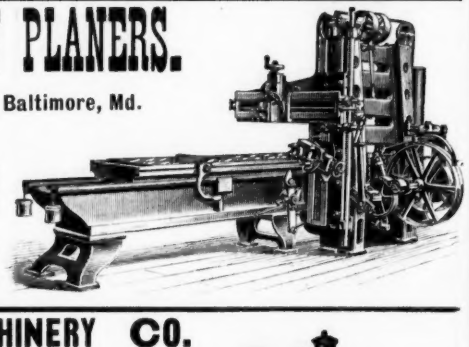

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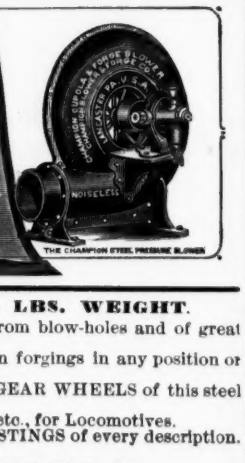

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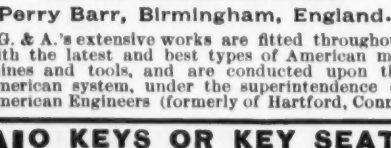

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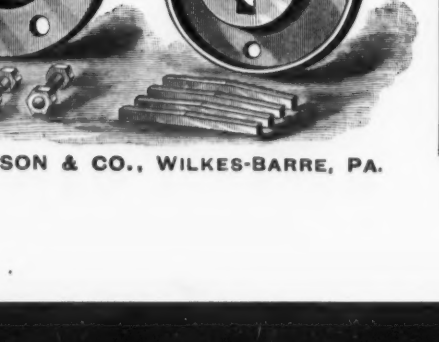
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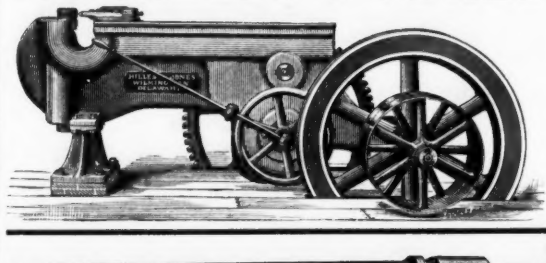
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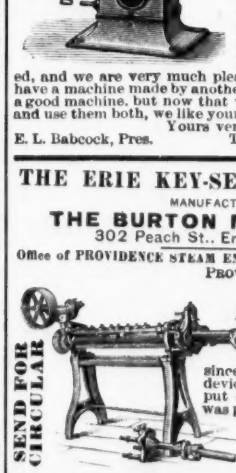
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Yours very truly,
E. L. Babcock, Pres. The Falls Rivet & Machine Co.

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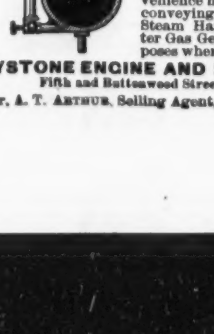

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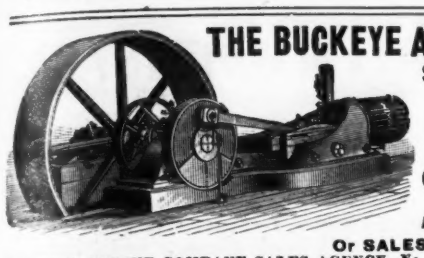

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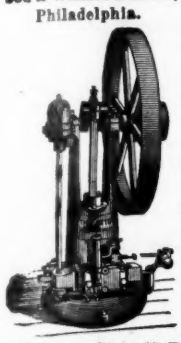

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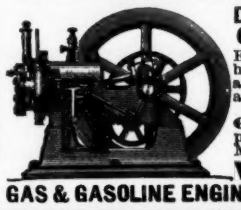

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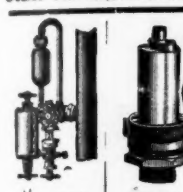

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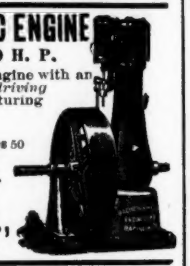

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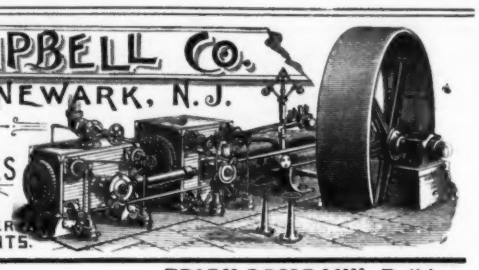

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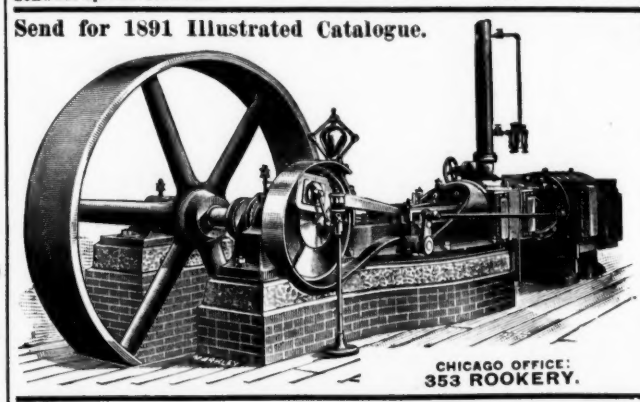

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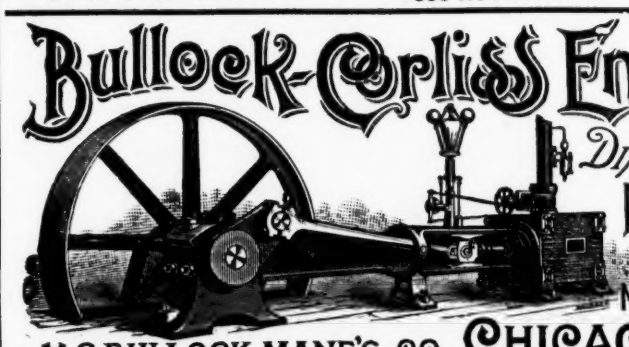

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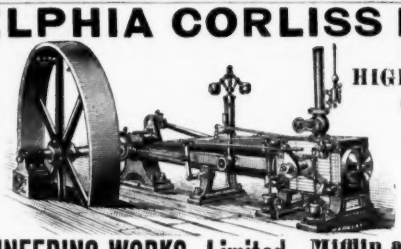

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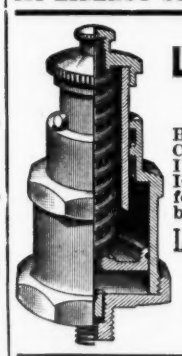

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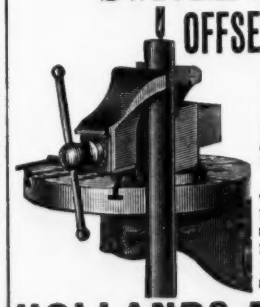

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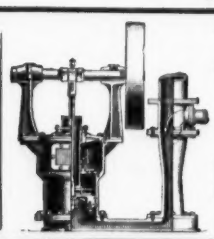

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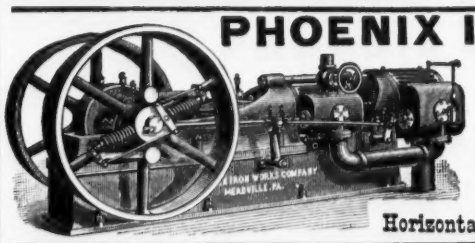

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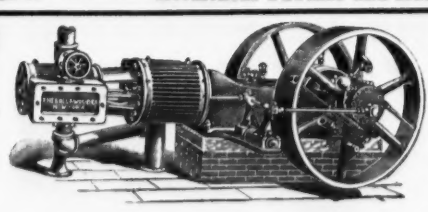

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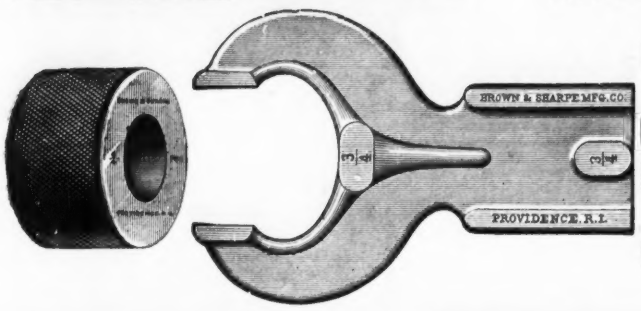

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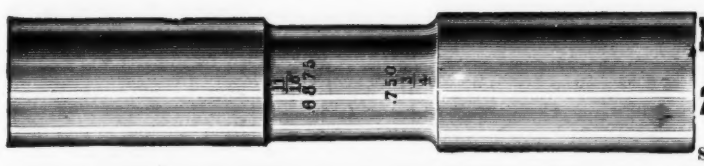

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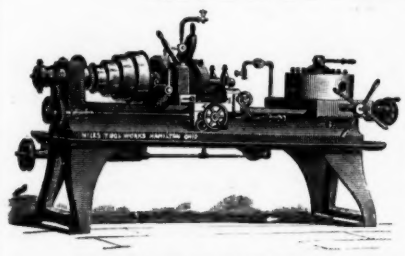

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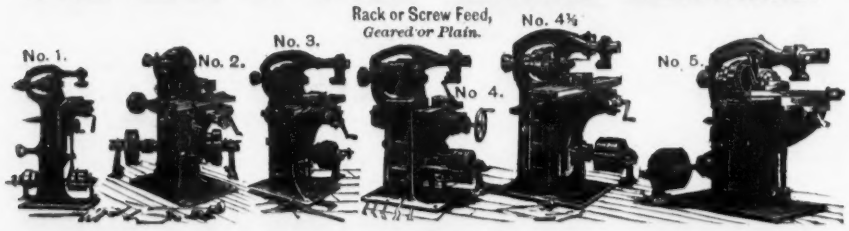

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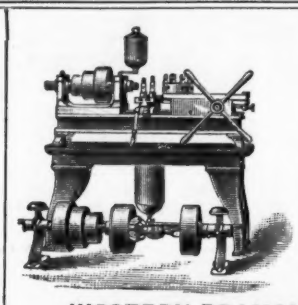

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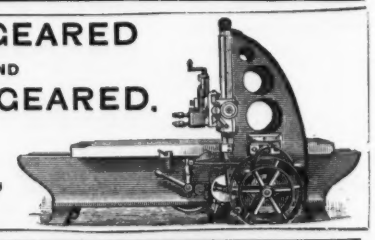

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